

# Accelerated healing: what can we do to achieve optimal healing times?

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## Article points

1. Understanding the wound healing process is essential to devising a strategy to improve healing for a diabetic foot ulcer.
2. There are a number of measures that can be taken that can help accelerate the wound healing process, including pressure relief, offloading and debridement.
3. If it is not possible to prevent ulceration, thorough wound assessment and timely interventions are essential to avoid the risk of amputation.

## Key words

- Diabetic foot ulcer
- Infection
- Offloading
- Pressure relief
- Wound assessment
- Wound healing

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**Diabetic foot ulcers often remain difficult to heal. It is vital that the clinician has an understanding of the wound healing process so that an effective care plan can be made to accelerate healing of ulceration. This article provides an overview of the process and outlines preventive approaches to ulceration. It stresses the importance of wound assessment and presents treatment choices that can be used to speed up healing and help the patient avoid the need for amputation.**

Once the skin is broken, the body responds to repair the injured area. Failure to heal can result in ulceration. A foot ulcer is thought to precede 75–85% of amputations in people with diabetes (Boulton et al, 2005) with an estimated cost of £1bn to the NHS in England. Two-thirds of the cost is spent on treating foot ulcers in primary, community and outpatient settings (Kerr et al, 2019). Alongside the cost to the NHS, foot ulcers have been shown to reduce quality of life (Ribu et al, 2007).

Understanding the wound healing process and undertaking a full wound assessment can reduce costs to the NHS and to the patient. This article aims to give readers an understanding of the factors that need to be considered when assessing a wound and seeking to provide optimum healing of the injured area.

## Factors to help improve healing Relieving pressure

Trauma or continued pressure can close off capillaries and reduce blood supply to the tissue, causing damage and delay to the healing process. Therefore, reducing pressure is key to optimise healing. Total contact casting (TCC) is considered the gold standard treatment for those with neuropathic ulceration. It reduces pressure to the affected area by load sharing, with the proximal portion of the cast carrying most of the load. A study

by Shaw et al (1997) obtained results from more than 750 foot contacts to conclude that forefoot pressure is significantly reduced in a TCC where the cast wall takes about 30% of the load directly from the leg. The same benefits were not identified with heel pressure relief.

It is the author's experience that few patients follow the recommended course of TCC to aid healing, preferring other strategies, such as removable walkers, to help offload. This may not be as effective, but it is easier for the patient to tolerate. One study showed that even the most compliant of patients wore their removable walker for 68% of the time and perhaps the most important attribute of a TCC is that it 'forces compliance' (Armstrong et al 2001).

Load redistribution is considered to play a smaller role. This is where plantar pressures are applied over a greater area thereby also reducing pressures in the ulcerated area (Greenhagen, 2012). In relation to plantar neuropathic ulcers there is some limited evidence that therapeutic shoes help to reduce planter pressures and aid healing (Bus et al, 2016).

Surgical intervention should also be considered where ankle equinus is recognised as a contributing factor to increase forces and plantar foot ulceration (Greenhagen et al, 2012). Options would be for a tendo-achilles lengthening or gastrocnemius recession to reduce these pressures and aid healing.

Pressure relief is a key component not only to promote healing but also to prevent ulceration.

## Debridement

Viable tissue supports viable tissue. When there is a sufficient blood supply, debridement should be encouraged as non-viable tissue, including macerated tissue, is a breeding ground for bacteria and must be removed to support growth of healthy tissue. Sharp debridement of a wound can also remove or weaken biofilms (Wolcott et al, 2013).

## Recognising infection

Infection can be localised, causing damage and necrosis in the tissues affected, and systemic symptoms can take hold within a matter of hours. People with diabetes with infected wounds are 56 times more likely to be admitted to hospital than a person without diabetes and be at risk of amputation (Frykberg et al 2006). It is, therefore, crucial to be able to recognise these symptoms early to avoid losing a limb.

Diagnosing infection can be difficult in patients with diabetes, as usual markers may not be evident. A patient with neuropathy 'may not report pain or fever or present with leucocytosis but will have increased oedema and wound exudate. A patient with an ischaemic ulcer of peripheral vascular disease may report pain, erythema, fever and leucocytosis but not have perfusion sufficient to produce oedema or increase wound exudate' (Wound Source, 2018).

All hospital, primary care and community settings should have guidelines for the use of antibiotics covering the care pathway for managing diabetic foot infection that consider local patterns of resistance but definitive therapy should be based on cultures of infected tissue after debridement (Lipsky et al, 2012).

## Oxygen

There is an increase in consumption of oxygen (O<sub>2</sub>) by active cells promoting cell metabolism which also helps prevent infection. Temporary hypoxia after injury triggers wound healing but prolonged or chronic hypoxia delays wound healing (Bishop, 2008). Hyperbaric O<sub>2</sub> therapy (HBOT) can counteract the influence of tissue hypoxia but there is little evidence to support its use except where using it as part of a clinical trial (NICE, 2015).

## Wound assessment/classification

The wound healing process consists of four stages which the wound goes through:

- **Inflammatory phase:** the body's emergency response to initial injury. The main aim is to prevent blood loss from tissue damage and vasodilation to allow fluid to carry the cells responsible for healing to enter the wound displaying the classic signs of heat, swelling and pain. This can last 10–15 minutes
- **Destruction:** debris is removed and the wound is cleaned with help from white blood cells which release chemicals to digest bacteria or tissue debris. These white cells die off leaving a creamy layer of slough. This can take 1–6 days
- **Proliferation:** this can only take place once the wound site has been cleared. New tissue is regenerated by fibroblasts which build blood vessels, collagen and other connective tissue to form granulation tissue. This starts off being pale pink but becomes bright red as it matures. This can last 3–24 days
- **Maturation:** it can take 21 days to 2 years for epithelial cells to move across granulation tissue to help the edges come together to heal (Brown, 2015).

By acknowledging these phases, it is clear to see why there can be numerous factors to consider when healing is delayed. *Box 1* lists some of the factors which may influence these stages of wound healing. Underlying comorbidities may also affect healing and need to be addressed to promote this complex process.

Having made an assessment on the phase of the wound, it would also be advised to determine the classification of an ulcer, to decide on the most appropriate care plan.

There is no universally accepted diabetic foot ulcer classification system. NICE (2015) advocates the use of either Texas or SINBAD — which focuses on site, ischaemia, neuropathy, bacterial infection, area and depth (Ince 2008), and the recently published guidance from the International Working Group on the Diabetic Foot (2019) also recommends using SINBAD to help determine factors required to heal the ulcer. The first action of which is to refer to a multidisciplinary diabetic foot team. Before deciding on a dressing, a wound assessment needs to be carried out and as a minimum it should include the elements listed in *Box 2*.

## Page points

1. Pressure relief can promote healing and prevent ulceration.
2. Diagnosing infection in people with diabetes can be difficult as the usual markers are often absent.
3. Wound assessment is essential when deciding how to treat a wound.

### Dressing selection

There is little evidence to support the use of a particular dressing for diabetic foot ulceration (Wu et al, 2014) but following an assessment, it would seem appropriate to follow NICE (2015) guidance and “choose the least costly dressing of the type that meets the required characteristics appropriate for the type of wound and its stages of healing”. Recent published recommendations suggests that dressings containing antimicrobial agents should not be used if their sole aim is to improve healing or propose to alter the ‘wound biology’, such as reduce biofilm (IWGDF, 2019). There is some evidence for the use of sucrose-octasulfate impregnated dressing in non-infected, neuroischaemic ulcers which has been shown to reduce healing times over a 20-week period (Edmonds et al, 2018).

Providing the right environment for healing to take place needs to be considered when selecting the most appropriate dressing. It is generally accepted that wounds require a moist environment to allow healing, except where the area needs to be dry, for example, in the case of an ischaemic wound (Health Service Executive, 2018). However, excess moisture or maceration can lead to an increased bacterial burden and subsequently have a negative effect on the state of the wound.

Poor dressing choice can also add to problems where fibres may be left in the wound, exudate remains unmanaged and drawn away from the healthy tissue or the bandage is too tight and

restricts much needed blood flow to the wound (Brown, 2018). The wound needs to be reassessed at every dressing change and if it is not showing signs of improvement, it will be necessary to reconsider the care plan.

### The future

The recently published guidelines on wound healing interventions from the International Working Group on the Diabetic Foot (IWGDF) report on strategies to help ulcers heal after delivering the best standard of care. There are new strategies to aid healing of chronic, difficult-to-heal wounds including placental derived products and a combined leucocyte, platelet and fibrin autologous product (IWGDF, 2019).

Technology also plays a role with the development of mobile phone apps to help patients self-care (Ogrin et al, 2018), which may also help to engage patients with their care and potentially contribute to promoting behaviour that improves healing.

Perhaps the best intervention is prevention, however not all wounds are preventable and being able to assess and understand what is required is paramount to optimise healing times. Thus, the best standard of care is early referral to the appropriate healthcare professionals; members of the multidisciplinary team who can assess and provide the best treatment plan to aid healing if ulceration occurs. ■

#### Box 1. Factors that may delay healing.

- Age and gender
- Diabetes
- Alcohol misuse
- Sex hormones
- History of healing disorders
- Smoking
- Stress
- Obesity
- Inadequate nutrition
- Ischaemia
- Medication, such as chemotherapy or steroids
- Compromised immune system.

(Source: Guo and DiPietro, 2010).

#### Box 2. Minimum requirements for a wound assessment.

- Type of wound and aetiology
- Location of wound
- Duration of wound
- Exudate description
- Condition of the wound bed
- Size of wound (measurement)
- Condition and sensation of peri-wound skin
- Presence of Infection
- Presence and nature of pain.

(Source: HSE, 2018).

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