

# HOW TO ASSESS SKIN AND NAIL CHANGES IN THE FEET OF PATIENTS WITH DIABETES

Caroline McIntosh and Veronica Newton are Senior Lecturers in Podiatry, University of Huddersfield, Yorkshire

Patients with diabetes mellitus are more prone to ulceration and infection than non-diabetics. Routine skin assessment allows detection of early changes. Patients presenting with skin or nail conditions should receive prompt referral to podiatry for skilled debridement and regular palliative care to prevent ulceration. This article will examine the important stages of the assessment process.

Current guidelines relating to the diabetic foot advise that all patients with diabetes should receive regular assessment of their lower limb circulation (vascular assessment) and regular testing for loss of sensation in the feet (neurological assessment) (Scottish Intercollegiate Guidelines Network [SIGN], 2001; National Institute for Health and Clinical Excellence [NICE], 2004).

However, it is also important that professionals involved in diabetes care provide regular visual examination of the lower limb. Changes to the skin can give an early indication of the patient's circulatory and neurological status as well as ulceration risk.

Evidence from trials studying the impact of podiatry in the prevention of diabetic foot ulceration shows that regular care of skin and nail problems by podiatrists results in a lower occurrence of ulceration for

diabetic patients (Ronnemaa et al, 1997; Plank et al, 2003). The diabetic foot should therefore be inspected regularly for skin abnormalities, breaks in the skin or pressure lesions.

Any break in the skin can result in tissue breakdown, infection and ulceration and so regular foot assessment is essential (McIntosh

and Newton, 2005). The aim of this article is to offer guidance, derived from best evidence, to help nurses to assess skin and nail problems in the diabetic foot and allow prompt recognition of common conditions that require a referral to a podiatry or tissue viability specialist.

## Skin assessment

People with diabetes require regular assessment of their lower limbs to identify any skin or nail changes that could result in ulceration. McIntosh and Newton (2005) recommend the ALERT system as a framework to assist practitioners when undertaking skin assessment:

- ▶▶ A — Ask the patient about the skin — how does it feel? By undertaking a thorough history and encouraging the patient to vocalise his or her concerns, clinical links can be made to diagnose the underlying cause of skin changes.
- ▶▶ L — Look at the skin — is it

**Table 1**

### Skin changes in diabetes

#### *Neuropathic changes*

Dry skin  
Dilated veins  
Warm to touch  
Red/pink in colour  
Callus with extravasation (spots of blood within the callus)

#### *Ischaemic changes*

Dry (anhydrotic) skin  
Thin skin  
Hair loss  
Cold to touch  
Pale skin



Figure 1. Neuropathic skin changes.



Figure 2. Ischaemic skin changes.



Figure 3. Heel fissure.

intact? Is there a break in the skin? Visually examine and scrutinise the surrounding tissues. Practitioners can quickly develop an appreciation of the early signs of skin changes that may be indicative of pre-ulcerative stages or underlying complications.

- ▶▶ E — Examine for signs of infection — heat, redness, pain, swelling — or look for any foot complications. Foot ulcers are susceptible to infection which may spread rapidly causing tissue destruction (Edmonds, 2005).
- ▶▶ R — Review previous treatment and the patient's notes. This simple process may be the absolute key to the success of future management to discover any compliance or personal neglect issues or to negotiate any changes needed to the management plan.
- ▶▶ T — Think about an individualised management plan. Be practical and realistic, e.g. does your patient have the ability to access healthcare?

### Skin changes in the diabetic foot

It is important that nurses involved in the assessment of the diabetic foot have an appreciation of skin changes that can occur as a result of abnormal functioning of the nerves in the lower limbs (peripheral neuropathy) and reduced arterial supply (ischaemia). These are both common problems affecting the feet of patients with diabetes. *Table 1* highlights the differences between skin changes that occur as a result of peripheral neuropathy and ischaemia (*Figures 1 and 2*).



Changes to the nails may also occur due to ischaemic and neuropathic changes. When the blood supply to the toes is compromised, the nails may become thickened, brittle and/or develop fungal infection. When the foot is insensate, unnoticed trauma from minor knocks or ill-fitting shoes can cause bruising under the nail.

### Common skin pathologies

#### Anhydrotic skin

Dry (anhydrotic) skin can result in skin fissures (cracks within the skin), particularly on the heel, which then increase the risk of infection (McIntosh and Newton, 2005). *Figure 3* shows a dry fissure on the heel. Any breach in skin integrity should be managed with appropriate wound care. In the case of a dry fissure, use an emollient and a moist dressing to promote wound healing.

#### Calluses and corn

Lesions on the foot such as a callus (*Figure 4*) or corn commonly occur at sites of high pressure caused by everyday activities such as walking or wearing ill-fitting footwear. As calluses and corns occur at sites of pressure they can precede ulceration in the diabetic foot, particularly if loss of sensation has occurred (sensory neuropathy).

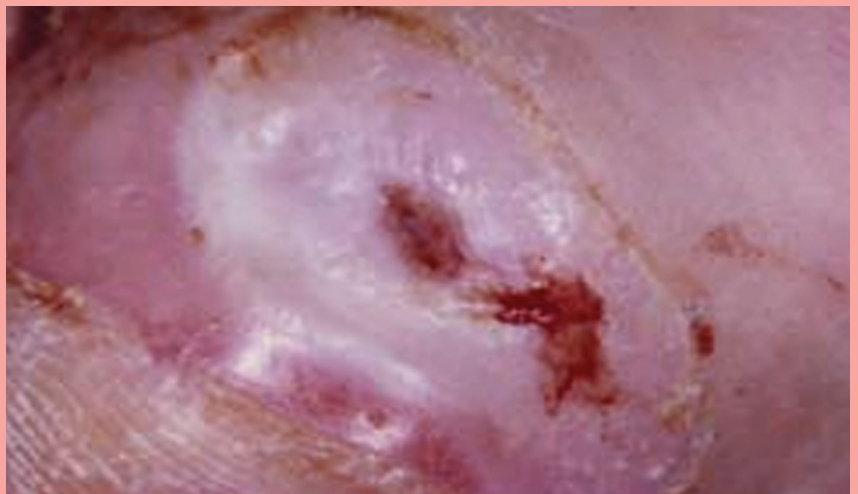
Evidence suggests that skilled debridement of calluses and corns decreases local pressure at the site of the lesion and therefore is paramount in the prevention and management of foot ulceration in the diabetic foot (Young et al, 1992; Murray et al, 1996; McIntosh and Newton, 2005). An extravasated callus (a callus interspersed



*Figure 4. Calluses on the sole (plantar region) of a neuropathic foot.*



*Figure 5. Callus with extravasation.*



*Figure 6. Ulceration on the ball of the foot showing signs of infection with localised cellulitis.*

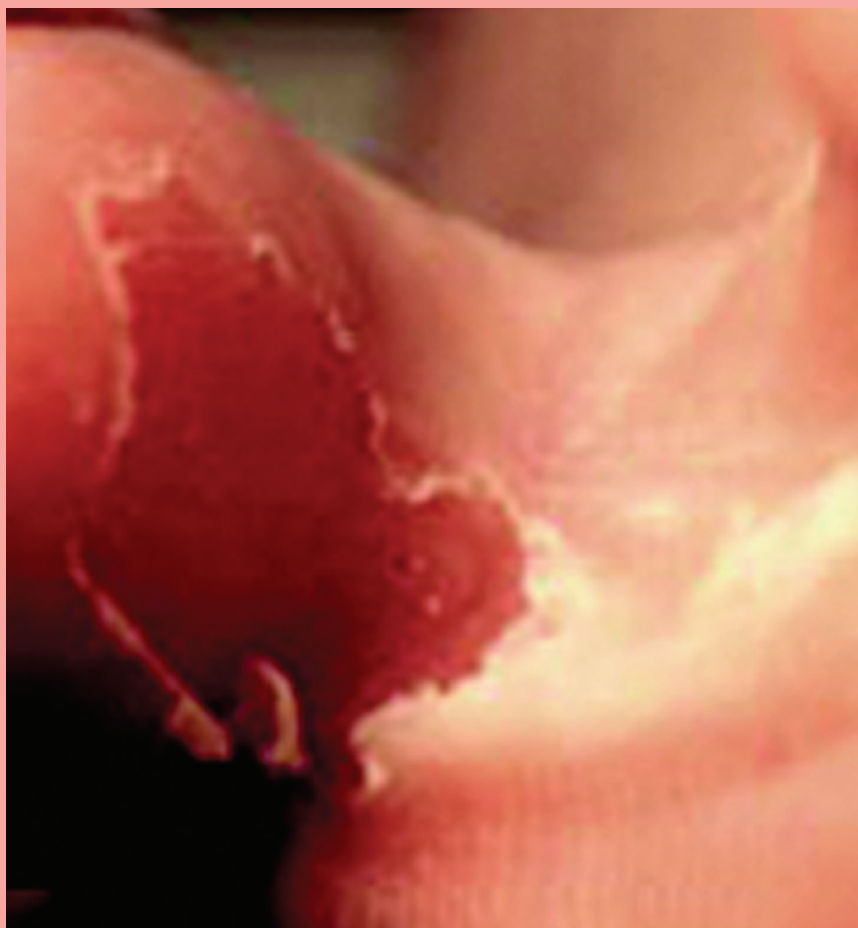


Figure 8. Maceration.



Figure 9. Fungal nail infection.

with spots of blood — *Figure 5*) indicates high levels of pressure and forewarns of potential tissue breakdown (McIntosh and Newton, 2005).

### Infection in the diabetic foot

A major challenge for nurses involved in assessing the diabetic foot is the prompt recognition of infection. People with diabetes are prone to developing infection of the skin and/or nails. This is because high blood sugar levels (hyperglycaemia) inhibits the normal immune response (Edmonds et al, 2004).

Infection can spread rapidly throughout the foot in a person with diabetes particularly in the presence of sensory neuropathy when pain sensation is absent (Foster, 2000). Therefore early identification and rapid management is essential.

### Bacterial infection

A clinical diagnosis of infection usually relies on visual signs: heat, redness, swelling and pain (Edmonds et al, 2004) (*Figure 6*). However, as a result of underlying ischaemia and neuropathy these signs can be masked and the practitioner should look for other markers of infection to ensure prompt diagnosis including:

- ▶▶ Malodour
- ▶▶ High temperature (pyrexia)
- ▶▶ Skin breakdown
- ▶▶ Increased exudate (Kingsley, 2001).

If bacterial infection is suspected, refer to the diabetes specialist foot care multidisciplinary team for urgent assessment.



A Wound Infection Continuum has been developed to assist practitioners in the accurate diagnosis of bacterial infection (Kingsley, 2001). This continuum has three key stages:

- ▶ Colonisation: all open wounds are colonised with bacteria but can still go on to heal without the need for intervention
- ▶ Critical colonisation: host defences are unable to maintain a healthy balance as bacterial burden increases. This can result in delayed healing and topical antiseptics are advised
- ▶ Infection: bacterial balance has increased substantially and host defences are overwhelmed. Systemic antibiotics are advised.

If a patient presents with signs of bacterial infection, the continuum above can help when deciding the most appropriate intervention. If bacterial infection is suspected immediate referral should be made to the diabetes specialist foot care team for further assessment.

If cellulitis is present it is useful to map the affected area with a marker pen to allow monitoring of any change, whether positive or negative.

Individuals with diabetes who develop nail pathologies, such as an ingrowing toenail, are at risk of developing infection secondary to the problematic nail. Once again the continuum can provide a useful tool to select the most appropriate intervention and referral pathway. Patients with nail pathologies should be referred for podiatry treatment.

### Fungal infection

Skin should be assessed for signs of maceration (softening of the skin as a result of moisture) or the presence of athlete's foot (tinea pedis). *Figure 8* shows maceration between the toes that could cause ulceration. An astringent such as surgical spirit can be used to dry macerated tissue and the patient should be advised to thoroughly dry between toes after bathing.

The effect of high blood sugar on the immune system means that diabetic patients are prone to developing fungal infection of the skin and nails (Rich and Hare 1999). *Figure 9* illustrates a fungal nail infection (onychomycosis). In the case of a suspected fungal infection, skin scrapings can be taken for microbiological analysis and if a positive diagnosis is made, antifungal preparations should be provided following discussion with the diabetes specialist foot care team.

### Conclusion

People with diabetes are more prone to ulceration and infection than non-diabetics. Routine skin assessment allows early identification of changes that in turn allows the implementation of management strategies to reduce the risk of ulceration. Evidence has demonstrated the positive impact that regular foot care has in the prevention of diabetic foot ulceration and thus diabetic patients presenting with skin or nail problems should be referred for podiatry treatment. **WE**

Edmonds M (2005) Infection in the neuroischaemic foot. *Int J Low Extrem Wounds* **4(3)**: 145–53

Edmonds M, Foster AVM, Vowden

P (2004) Wound bed preparation for diabetic foot ulcers. In: European Wound Management Association (EWMA). *Position Document: Wound Bed Preparation in Practice*. MEP Ltd, London: 6–11

Foster A (2000) Diabetic foot ulceration. In: *Essential Wound Healing*. Johnson & Johnson Medical, Ascot: 1–7

Kingsley A (2001) A proactive approach to wound infection. *Nurs Stand* **15(30)**: 50–8

McIntosh C, Newton V (2005) Diabetic foot ulcers. In: White R, Ed. *Skin Care in Wound Management: Assessment, Prevention and Treatment*. Wounds UK, Aberdeen: 47–73

Murray HJ, Young MJ, Hollis S, Boulton AJ (1996) The association between callus formation, high pressures and neuropathy in diabetic foot ulceration. *Diabet Med* **13(11)**: 979–82

NICE (2004) *Type 2 Diabetes: Prevention and Management of Foot Problems. Clinical Guideline 10*. National Institute for Health and Clinical Excellence, London

Plank J, Haas W, Rakovac I, et al (2003) Evaluation of the impact of chiropodist care in the secondary prevention of foot ulcerations in diabetic subjects. *Diabetes Care* **26(6)**: 1691–5

Rich P, Hare A (1999) Onychomycosis in a special patient population: focus on the diabetic. *Int J Dermatol* **38 (suppl 2)**: 17–19

Ronnemaa T, Hamalainen H, Toikka T, Liukkonen I (1997) Evaluation of the impact of podiatrist care in the primary prevention of foot problems in diabetic subjects. *Diabetes Care* **20(12)**: 1833–7

Scottish Intercollegiate Guidelines Network (2001) *Management of Diabetes: A National Clinical Guide*. SIGN, Edinburgh (<http://www.sign.ac.uk/guidelines/fulltext/55/index.html>) (last accessed 4 May 2006)

Shaw JE, Boulton AJM (2001) The diabetic foot. In: Beard JD, Gaines PA, eds. *Vascular and Endovascular Surgery*. 2nd edn. WB Saunders, London: 105–26

Young MJ, Cavanagh PR, Thomas G, Johnson MM, Murray H, Boulton AJ (1992) The effect of callus removal on dynamic plantar foot pressures in diabetic patients. *Diabet Med* **9(1)**: 55–7