Preventing foot ulcers

Kerry May, Manager, Podiatry, Diabetic Foot Unit Coordinator, The Royal Melbourne Hospital, Melbourne

Summary

Foot ulceration is an unfortunate complication of a number of chronic diseases, especially diabetes mellitus. Patients with peripheral neuropathy, foot deformity or peripheral vascular disease have an increased risk of developing foot ulcers. Ulceration is often preventable and the general practitioner is in a unique position to ensure timely assessment, education, management and referral for at-risk patients. Most of the evidence for reducing the risk of foot ulcers comes from studies in diabetes. However, it is not unreasonable to apply similar principles to people with other diseases who are also at risk of developing foot ulcers.

Key words: deformity, foot ulcers, peripheral neuropathy, peripheral vascular disease, risk reduction.

(Aust Prescr 2008;31:94–6)

Introduction

Foot ulceration may be defined as the erosion of tissue or a breach of the epidermis at a site distal to the ankle. There are a number of conditions that place a person at risk of developing foot ulceration. These include, but are not limited to, diabetes (see Aust Prescr 2007;30:21–4), peripheral vascular disease, end-stage renal failure, vitamin B_{12} deficiency, gout, rheumatoid arthritis, scleroderma and cerebral palsy, or any other condition that affects the circulation, structure or sensation of the feet. Timely referral to a podiatrist or appropriate specialist may assist these patients to prevent or manage possible foot complications. The general practitioner has an important role in not only identifying people requiring specialist referral, but also educating those at risk about appropriate self-management and risk reduction.

Risk factors

Common risk factors for foot ulceration include peripheral neuropathy, structural deformity of the foot, peripheral vascular disease, trauma and a history of foot ulceration and/or amputation.

Peripheral neuropathy

Many of the conditions that place individuals at increased risk of developing foot ulcers share the common factor of peripheral neuropathy. In patients with peripheral neuropathy, trauma and injury can occur without them knowing. For many people this means that they cannot detect a foreign object in the shoe, or that their shoe does not fit correctly. Undetected trauma is often untreated trauma, and can have potentially limb-threatening consequences. Peripheral neuropathy may also contribute to the development of foot deformity, as well as changes in the skin.

One way to diagnose neuropathy in the clinical setting is with the 10 g Semmes Weinstein monofilament (Fig. 1). Failure to detect the monofilament at any one of the test sites (Fig. 2) indicates the presence of peripheral neuropathy.[1]

Foot deformity

Foot deformity results in increased foot pressures and when combined with an additional risk factor, such as neuropathy, places the patient at significant risk of developing a foot complication.[2] Foot deformity may be congenital, or develop as a consequence of poor footwear or as part of a disease process, especially for those with rheumatoid arthritis and diabetes. The most common foot deformities are claw or hammer toes, bunions, callus, previous surgical sites and a lowered medial longitudinal arch.

Fig. 1

Using a monofilament to assess sensation in the foot

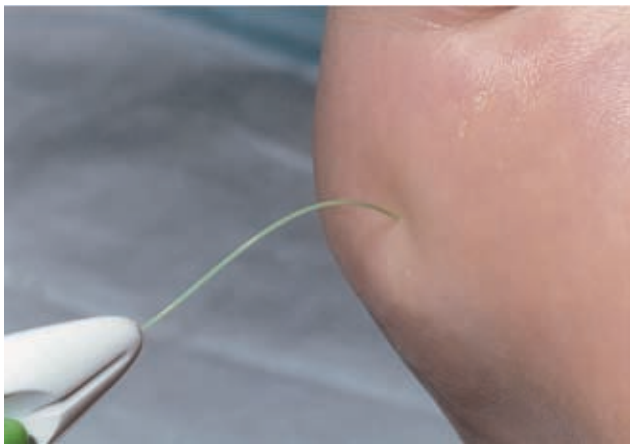
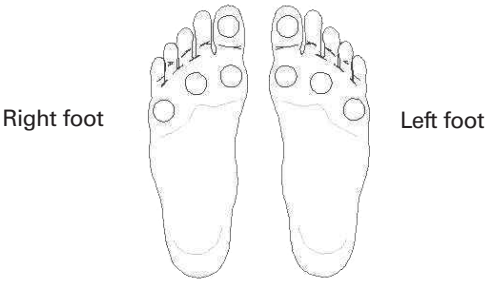


Fig. 2

Monofilament testing sites



Peripheral vascular disease

Peripheral vascular disease is not often the cause of foot ulceration, but is a contributing factor in poor or delayed healing of foot ulcers.[3] A simple clinical test for diagnosing peripheral vascular disease is palpation of the foot pulses. Absence of these pulses indicates a high likelihood of peripheral vascular disease, which may warrant further investigations.[4] Assessment of the microcirculation is more difficult but can be achieved with measurement of toe pressures. A toe pressure of greater than 30 mmHg suggests a wound is likely to heal with conservative therapy.[5]

Trauma

People often think that trauma to the foot is what precipitates foot ulceration, with little credit being given to the contribution of underlying disease process or other risk factors. Certainly, a blister from new shoes or a burn from a hot water bottle are precipitating events in ulcer formation. However, it is the consequences of the underlying disease process that result in the non-healing or problem foot ulcer. Preventing trauma often prevents foot ulceration.

History of foot ulceration or amputation

Previous ulceration or amputation are recognised as the most significant risk factors for developing further ulceration.[6] This probably represents the underlying limb pathology, and may also be related to gait changes that result from an amputation.[7,8] A person with diabetes and a history of foot ulceration or amputation must be considered at ongoing high risk for developing further ulceration and be referred to a podiatry service for monitoring and management. There is evidence to support reduced re-ulceration and amputation rates in people with diabetes who access regular podiatry care.[9,10,11]

Preventative measures

It is important to optimise the treatment of underlying conditions, such as peripheral neuropathy, which can increase the risk of developing foot ulcers. Regular foot inspections by a general practitioner are a good opportunity to check that the feet are free from injury, but also to reiterate advice and discuss any concerns the person may have.

Patients should be educated about how to reduce their risk of developing foot ulcers (Table 1). This is especially important for people with peripheral vascular disease who are more likely to require a referral for expert assessment, monitoring and management than those with neuropathy. People with early stage vascular disease should be encouraged to 'move it or lose it' to maintain their circulation, with the exception of people who currently have an active foot problem.

Table 1

Foot care for patients at risk of foot ulcers [12]

Advice	Points to highlight
Daily foot inspection	Check between the toes and underneath the feet Look for any breaks in the skin, areas of rubbing or signs of infection
First aid for injuries	Apply antiseptic (e.g. povidone-iodine) to the injury, followed by a protective cover (e.g. dry dressing such as cutiplast) Seek expert assistance when an injury is not healing
Self-care	Wash feet daily and dry thoroughly, especially between toes Daily use of an emollient to prevent drying and cracking of the feet, such as sorbolene Filing in preference to cutting of nails. If nails are cut this should be straight across and the nail edge should be left longer than the most distal aspect of the nail sulcus (see Fig. 3). Use of a pumice to reduce callus development. This should only be undertaken when a person has no neuropathy and has had a safe technique demonstrated to them by their podiatrist or general practitioner.
Risk reduction	Never walk barefoot Beware of sources of heat (heaters, hot water bottles) as a cause of trauma Treat tinea infections promptly with an appropriate topical antifungal such as terbinafine preparations. Any breach of the epidermis increases the risk of bacterial infection.
Well-fitting footwear	Wear shoes with a wide and deep toe box (should be able to freely move toes inside) Shoes should have leather upper, minimal internal seams, firm fastenings (laces or velcro), a firm heel counter (the rear of a shoe should be able to hold its shape under firm pressure) and a cushioning sole New shoes should be worn in slowly to minimise the risk of the shoe causing a foot ulcer. A podiatrist usually recommends starting at one hour a day, increasing the time the shoe is worn by an hour each day as long as no problems are detected.

The most basic but important advice for individuals with neuropathy is to inspect their feet daily for signs of trauma. This can be difficult for some people with visual or physical disabilities. Where a family member or carer is not available, most people are able to adequately perform this function using a good quality magnifying mirror to inspect the plantar surface of the foot. Patients should also be advised to inspect their footwear for foreign objects before wearing, and check their shoes are a good fit.

People with foot deformity should be educated on the importance of purchasing well-fitting footwear, and for more severe cases that are affecting day-to-day function, a referral to a podiatrist or orthotist for pressure-relieving orthoses and/or specialist footwear may be of assistance.

The best advice people can be given is to seek professional help as soon as a foot problem develops, or is not resolving. Any person identified as being at high risk for ulceration should not only receive detailed education on risk reduction, but should also be referred for podiatry care.

Conclusion

Foot ulceration is preventable with suitable assessment, management and education. The regular access and individual relationships that people with a chronic disease have with their general practitioner provide excellent opportunities to reduce the risk of foot ulceration. When individuals at high risk develop a foot complication, they should be promptly referred to specialist health professionals with expertise in managing these conditions to maximise wound healing and reduce the risk of lower limb amputation.

References

1. Kumar S, Fernando DJ, Veves A, Knowles EA, Young MJ, Boulton AJ. Semmes-Weinstein monofilaments: a simple, effective and inexpensive screening device for identifying diabetic patients at risk of foot ulceration. Diabetes Res Clin Pract 1991;13:63-7.
2. Diabetes Australia. National evidence based guidelines for the management of type 2 diabetes mellitus. Part 6: Identification and management of diabetic foot disease. 2005.
3. Pomposelli FB Jr, Jepsen SJ, Gibbons GW, Campbell DR, Freeman DV, Miller A, et al. Efficacy of the dorsal pedal bypass for limb salvage in diabetic patients: short-term observations. J Vasc Surg 1990;11:745-52.
4. McGee SR, Boyko EJ. Physical examination and chronic lower-extremity ischemia: a critical review. Arch Intern Med 1998;158:1357-64.
5. Kalani M, Brismar K, Fagrell B, Ostergren J, Jorneskog G. Transcutaneous oxygen tension and toe blood pressure as predictors for outcome of diabetic foot ulcers. Diabetes Care 1999;22:147-51.
6. Murray HJ, Young MJ, Hollis S, Boulton AJ. The association between callus formation, high pressures and neuropathy in diabetic foot ulceration. Diabet Med 1996;13:979-82.
7. Boyko EJ, Ahroni JH, Stensel V, Forsberg RC, Davignon DR, Smith DG. A prospective study of risk factors for diabetic foot ulcer. The Seattle diabetic foot study. Diabetes Care 1999;22:1036-42.
8. Day MR, Harkless LB. Factors associated with pedal ulceration in patients with diabetes mellitus. J Am Podiatr Med Assoc 1997;87:365-9.
9. Plank J, Haas W, Rakovac I, Gorzer E, Sommer R, Siebenhofer A, et al. Evaluation of the impact of chiropodist care in the secondary prevention of foot ulcerations in diabetic subjects. Diabetes Care 2003;26:1691-5.
10. Young MJ, Cavanagh PR, Thomas G, Johnson MM, Murray H, Boulton AJ. The effect of callus removal on dynamic plantar foot pressures in diabetic patients. Diabet Med 1992;9:55-7.
11. Sowell RD, Mangel WB, Kilczewski CJ, Normington JM. Effect of podiatric medical care on rates of lower-extremity amputation in a Medicare population. J Am Podiatr Med Assoc 1999;89:312-7.
12. International Consensus on the Diabetic Foot. Practical guidelines on the management and prevention of the diabetic foot [DVD]. International Diabetes Federation; 2007.

Fig. 3

Correctly cut big toenail

Further reading

Australian Wound Management Association. Standards for wound management. AWMA; 2002. http://www.awma.com.au/publications/2007/awma_standards.pdf [cited 2008 Jul 10]

Patient resource:

Australasian Podiatry Council. Your podiatrist talks about diabetes. http://www.feet.org.au/images/publications/Diabetes.pdf [cited 2008 Jul 10]

Conflict of interest: none declared

Self-test questions

The following statements are either true or false (answers on page 111)

3. Peripheral vascular disease is often the cause of foot ulceration.
4. Daily foot inspection is advisable for patients with peripheral neuropathy.