



One pair must last a lifetime

Misshaped feet

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This article is the fifth in this series examining issues in foot care. This month the authors outline care issues regarding misshaped feet.

Mark's story

Mark is 64 and has had type 2 diabetes for 10 years. He has had trouble with shoe fit because of a bunion (hallux valgus) for as long as he can recall. His mother had the same problem and he remembers her suffering with painful feet.

Mark has been trimming the thick callus under his foot with scissors to stop it being painful to walk on. He has never seen a podiatrist and cannot recall anyone ever checking his feet. Over the past two years the area on his sole has become less painful and he noted a 'numbness' in his feet. Last month he noticed an uncomfortable 'lump' under his foot when drying his feet. He went to see a podiatrist who removed the callus and revealed necrotic fluid within a weight bearing ulcer adjacent to the metatarsal head (Figure 1). Examination reveals reduced sensation to touch and sharpness under the forefoot. Fortunately his pulses (dorsalis pedis and posterior tibial) were normal indicating good vascular supply to the foot. The ulcer should heal as long as it is kept clean and moist and protected from pressure.



Figure 1. John's ulcer.

Appropriate management

In retrospect Mark's ulcer was clearly preventable. Diabetes assessment includes a foot check as part of the annual review.¹ Ten years ago Mark's misshaped foot should have triggered referral to a podiatrist who could prescribe footwear and possibly orthotics which would protect and support his feet rather than damage them.

Regular review would have identified his peripheral neuropathy several years ago. Mark would then have two major risk factors for foot problems (Table 1)² and this would prompt a review of his footwear and footcare to minimise the risk of inadvertent and undetected damage (mechanical, chemical or thermal). The

Table 1. Traffic lights

Mark's assessment revealed one 'red light' signalling foot risk. Note also the two 'amber lights' which indicate some sensory loss and poor self care due to poor knowledge about foot care. The 'green lights' are Mark's saving grace. In the short term this ulcer should heal — the long term aim is to ensure it's the last.

1	2	3	4	5	Risk level
Neurological	Vascular	Structural	Self care	Past ulcer	
○	○	●	○	○	danger
●	○	○	●	○	caution
○	●	○	○	●	healthy

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Figure 2. Biomechanics of walking. Illustration of the gait cycle from heel strike to toe-off for one step.

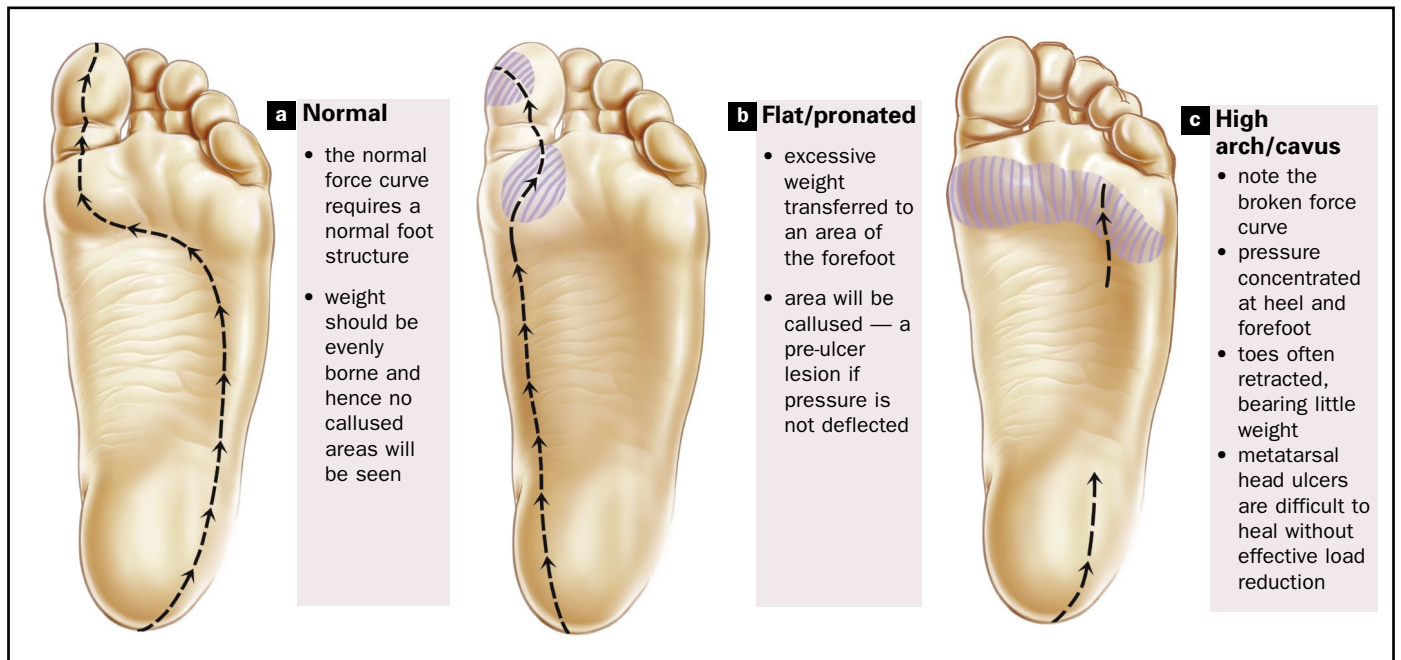


Figure 3. Representations of the weight-bearing force curves for the a) normal; b) flat; c) high arch foot type during gait. Shaded areas show possible pressure foci and ulcer sites. Orthotics and footwear need to 'normalise' force curves and deflect peak pressures to avoid heel ulcers.

general practitioner, podiatrist and Mark should develop a personal and professional monitoring program and an action plan to detect and respond to problems early.

The problem with feet...

Feet are usually regarded as necessary but inelegant, messy, smelly and sometimes uncomfortable appendages. Feet are often a nuisance because they need special maintenance (especially cutting

thick dry nails) and expensive shoes. We don't understand the biomechanics that allow the sudden, repeated impact of body weight to be cushioned, distributed over the foot and transmitted to the tibia and thus to the femur, pelvis and spine (Figure 2). Nor do we appreciate the effectiveness of the built in systems that protect the feet from damage and maintain the skin and cycles of moisture and dryness, warmth and cold. The oddly

shaped lumps on the ends of our legs are indeed complex.

Misshaped feet are often associated with abnormal distribution of weight bearing loads (Figure 3) and with pressure from footwear that has been designed for normally shaped feet — or to turn that inelegant peripheral lump into a fashion statement (Figure 4).

Shoe inserts (orthotics) and/or specially designed footwear can redistribute

loads away from high pressure or damaged areas. Spreading the load over a larger area reduces pressure on any one area and reduces the tendency for skin and nail thickening or damage.



Figure 4. Fashion statement.

The skin and nail response to increased pressure is thickening (eg. callus, corn) which may cause its own problems by focusing load on to the base of the thickening. The repeated compression and shearing can cause damage, inflammation and the necrosis that was revealed when Mark's callus was removed (Figure 5).

Usually pain/discomfort gives early warning of developing problems and forces the individual to avoid or remove the source of pressure or to seek professional help. However, coexistent neuropathy allows the process to continue (as with Mark). The loss of pain and position sense results in an anaesthetic foot being banged clumsily on to the ground and loss of motor fibres and muscle atrophy destroys the foot's capacity to distribute loads (see neuropathy article this series).³

As long as there is adequate circulation (and no excess pressure) the healing process will continue and infections will be resisted. However, once circulation is impaired ongoing pressure will cause tissue necrosis and spreading tissue infections occur. Misshaped feet are therefore one of the major risk factors for foot ulcers. The appropriate response is to:

- check for other risk factors which would dramatically multiply the excess risk
- remove the thickened skin and trim the thickened nails*
- treat any coexisting ulcer
- develop appropriate footwear that will distribute load and protect the feet

* The 'corn cures' that are sold over the counter are dangerous in those with neuropathy since the 'cures' will remove normal as well as thickened tissue. A corn should be regarded as an indicator of pressure and removal should be performed by a podiatrist.

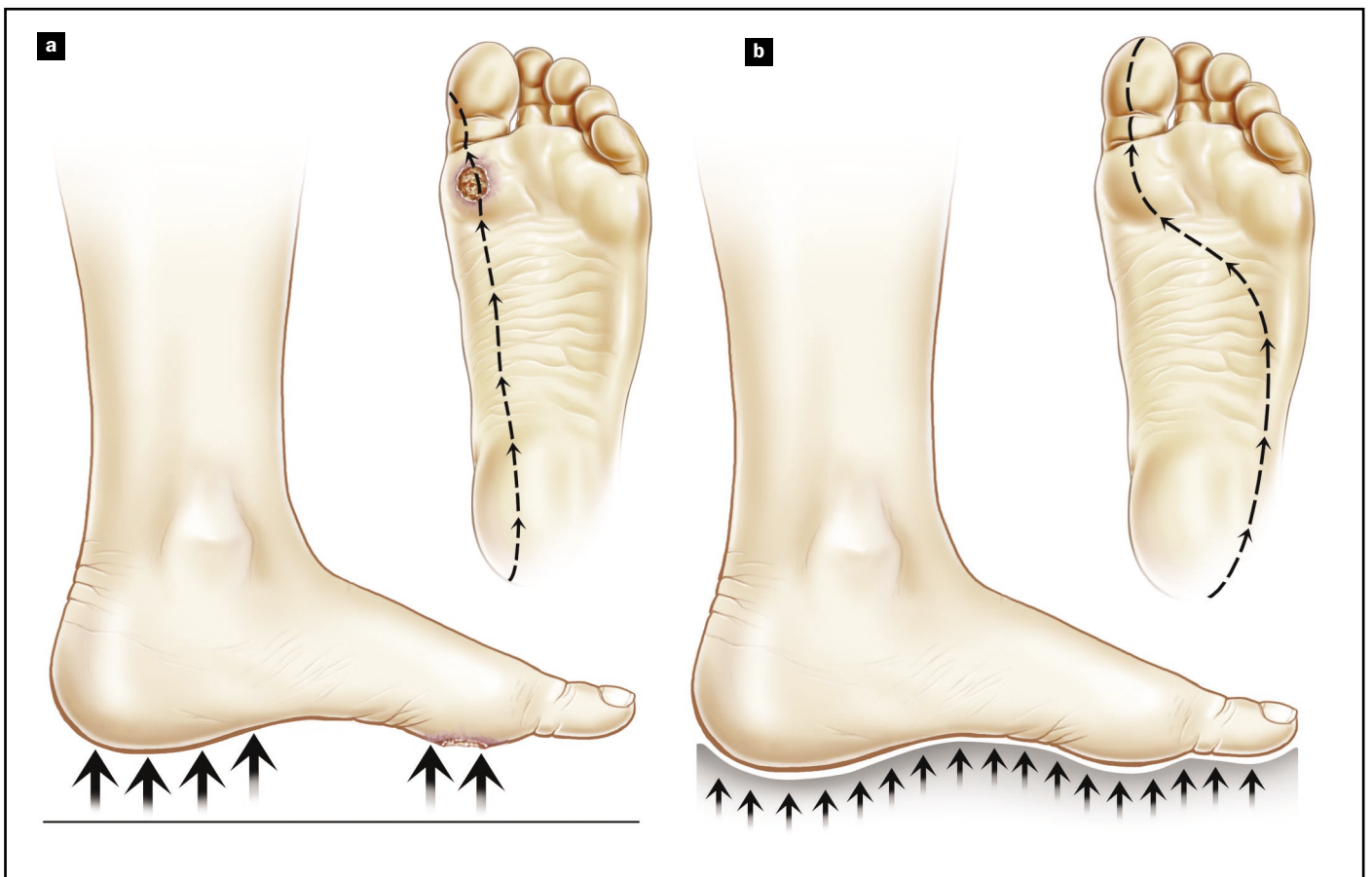


Figure 5. Pressure, callus, ulcer. Appreciation of foot biomechanics is essential to reduce destructive peak pressures from areas which can subsequently ulcerative — especially if pain is absent. a) shows the peak forces over an ulcer site and the abnormal force curve across the foot during gait. Note: the gait loads focus at the ulcer site; b) shows the results of effective orthotic therapy which reduces peak force at the ulcer site and restores the normal force curve across the foot.

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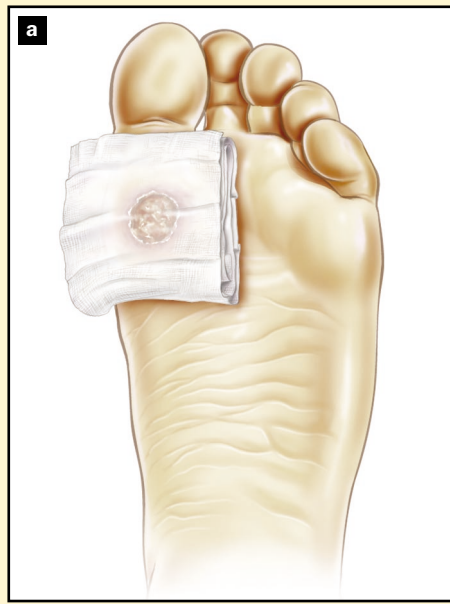


Figure 6. Redistribution of pressure. a) it is very tempting to place a large soft dressing over an ulcer to 'protect' it. However such action actually increases the pressure to the wound site which demotes healing; b) deflective padding is essential and effective for weight-bearing ulcers. A light dressing can then cover the wound without increasing load.

- explain why the foot is at risk and how the footwear will help
 - show the patient (or carer) how to care for the feet (see article 6 this series)⁴
 - develop a personal and professional monitoring program and action plan to detect and respond to problems early.
- A podiatrist is the appropriate professional to oversee this process and to monitor future progress. Foot care and patient education are their area of expertise and they have access to the necessary tools and equipment. Appropriately designed dressings⁵ redistribute pressure away from any ulcer and orthotics redistribute weight bearing loads so that it is more evenly distributed (*Figure 6*).

References

1. Holmwood C, et al. Diabetes Management in General Practice. Royal Australian College of General Practitioners and Diabetes Australia. Canberra: National Capital Printing, 2001.
2. Phillips P, Evans A. One pair must last a lifetime: footcare in diabetes. *Aust Fam Physician* 2002; 31(6): 546–549.
3. Phillips P, Evans A. One pair must last a lifetime: painless ulcers. *Aust Fam Physician* 2002; 31(5): 453–454.
4. Phillips P, Evans A. One pair must last a lifetime: footcare. *Aust Fam Physician* 2002; 31(8): (in press).
5. Evans A, Phillips P, Popplewell P. Dressings. *Diabetic foot ulcers. A guide to treatment. Current Ther* 1997; 38: 25–34.

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SUMMARY OF IMPORTANT POINTS

- Misshaped feet directly increase pressure because of abnormal biomechanics and indirectly increase foot pressure because of difficulty with shoe fit.
- Constant pressure reduces blood flow and increases the risk of skin breakdown and slow healing.
- The skin reaction includes thickening, callus and corn formation.
- Skin thickening is a marker of a pressure problem but also itself increases the pressure and ulcer risk.
- A weight bearing callus must be regarded as a pre-ulcer site and must be addressed by a podiatrist from a biomechanical perspective. Simple observation and appreciation of the significance of a weight bearing lesion can prevent a lot of later problems.
- The combination of pressure and neuropathy often causes thickened skin, corns and callus which can directly lead to an ulcer because of 'painless' tissue shearing or indirectly when misdirected 'corn cures' cause ulcers.
- Appropriate care of misshaped feet lies in relieving pressure with footwear that fits and orthotics which can counteract biomechanical problems.
- Debridement of a callus should be followed by assessment of the foot mechanics, prescription of appropriate footwear and insoles or orthotics as needed.
- The podiatrist has a key role in management of misshaped feet.