The Prevention of Recurrent Ulceration and Amputation

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Patients with recurrent ulceration and amputation can be challenging cases for health-care teams. There are, however, several different approaches that can prevent the recurrence of ulceration and reduce the incidence of amputation. One approach centres on the patient and their supports. It is crucial to remember that wounds are attached to people. To provide optimal care, health-care professionals must look at the whole health picture—patient comorbidities, strength, sensation, foot biomechanics and mental health—and also their housing, occupation, transportation, social supports and caregiving responsibilities.[1–2] Treatment must take into account the instrumental activities of daily living and the patient's social history.

Offloading Measures

A rehabilitation approach to wound treatment can optimize function and recovery and meet a secondary goal of prevention. During treatment, clinicians must consider the patient's ability to move safely, and remember that offloading measures like casts or crutches may affect balance. They can recommend gait aids, wheelchairs and/or therapy interventions to reduce the chance of falling. While offloading patients, clinicians should try to ensure the contralateral foot does not face any additional trauma from hopping or carrying extra weight. In patients with an offloaded diabetic foot ulcer, clinicians should watch for pressure injuries in the other foot and coccyx region, since these patients are likely more sedentary. Health-care professionals should also check if the offloading device is causing a leg length discrepancy, which might result in injuries to the contralateral limb and/or back, and increase the risk of falls.[1]

Social Determinants

The health-care team should also consider environmental factors. If a patient lives in a multi-storey home, they will have to climb stairs. Within the home, there are hazards such as wet bathroom floors. They may have to drive to and from the hospital or work. Driving puts patients at an especially high risk for recurrence, as it loads the right foot.

Barriers to a rehabilitative approach to care include lack of access to care, and the cost of offloading, footwear and mobility aids. Patients may also be unaware that long-term solutions are needed and may resist or be unable to properly offload or modify their lifestyle—especially if they do not have the resources to adhere to treatment requirements. A multidisciplinary approach to wound care and the integration of social work and community charities can help to overcome these barriers.

Foot Checks and Footwear

Another approach to recurrent ulceration and amputation prevention is the quick foot check, called the Look-Touch-Stand method. This method can help with finding potential mechanical causes of ulceration and determining offloading solutions. When undergoing the foot check, the patient should be in a non-weightbearing position: sitting or on a plinth with their feet out.

The Look step involves a quick scan of the dorsal and plantar surfaces of the feet to check for trophic changes and temperature differences. Trophic changes include skin colour shifts, callusing, nailbed or structural change and hair presence. Temperature differences appear as thin dry skin, thickened nails, colour changes and capillary refill.

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The Touch step checks for foot temperature, capillary refill and edema.

The Stand step requires the patient to stand (if possible) so that the clinician can look at the position and motion of the hindfoot and forefoot.

If the Look-Touch-Stand check finds biomechanical foot issues that are correctable, the patient's feet should be put in a neutral position to reduce concentrations of pressure through methods like posting.

Footwear is also key to significantly reducing the development of repetitive pressures. Clinicians can test if footwear is safe and healthy through the bend-twist-fold test (Figure 1), which is used to ensure the footwear is stable. Orthotics are also important for offloading. Flat peg orthotics are a start but have minimal long-term success. Multi-density custom orthoses are better for accommodating wounds.[3]

Neuropathy

Neuropathic wounds are another challenging diagnosis and are prone to recurrence. These wounds are primarily caused by a combination of neuropathy and biomechanical forces. Patients lose the ability to feel pressure and shear in or on their lower limbs, and wounds develop. Diabetic neuropathy cannot typically be cured, but the biomechanical forces causing the wounds can be successfully addressed. Approximately 40% of ulcers in patients with neuropathy recur within the first year of closure, and 60% recur within three years.[4] Neuropathic ulcers are also prone to infection, and one-third of ulcers can become infected within 12 weeks.[5–7] Infection often leads to amputation: 20% of diabetic foot ulcers result in amputation.[8]

Surgical Intervention

Surgical offloading with lesser digital ulcers can undo digital contracture. Contracture can be caused by neuropathy and is often seen with pronated feet where muscles—mainly the posterior tibial tendon and flexor digitorum longus (FDL) tendon—have tried to oppose pronation. The FDL tendon can pull obliquely, which pulls digits to their side. This leads to contractures and rolling digits, which in turn leads to pressure and pressure points, and then ulceration at the tip of the

Figure 1: The Bend-Twist-Fold Test.

toes or between the toes. Flexor digitorum longus tenotomy is a simple surgery during which a surgeon goes into the digit from the side and makes an incision into the FDL tendon to release the contracture. A literature reviews indicates that of 324 of these procedures, 320 healed, 29 had recurrences, four did not heal and eight had complications.[9–15]

If an ulcerated digit cannot be straightened, it may be necessary to remove bone from the toe to achieve correction This procedure usually resolves the ulcer, and immediate weightbearing is allowed.

Some 24 to 40% of all diabetic foot ulcers are hallux ulcers.[16–19] The primary cause of hallux ulcer formation is lack of motion in the metatarsophalangeal joint—minor decrease in motion is called hallux limitus, and more significant decrease is hallux rigidus. Both come from functional or structural causes, like a first metatarsal that is slightly ahead of the second metatarsal or foot pronation. While most ulcers have a recurrence rate of 60% within three years, hallux ulcers have a recurrence rate of 83% by 31 months.[20] The procedure used to fix this issue, most commonly known as a Keller arthroplasty, or a 1st MTPJ arthroplasty, is to make a cut across the base of the proximal phalanx and remove the entire base, which creates a space between the proximal phalanx and first metatarsal where soft tissues can be interposed to prevent the bones from grinding together.

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Ulcers on the first metatarsal are often caused by a stiff or long first ray, which gets stuck in a toe-off position, or a plantarflexed first ray that keeps the first metatarsal lower than the rest so that it takes more force than the others. They are often treated with offloading orthotics. Surgery on patients with diabetic foot disease is often considered a risk, but generally, appropriately selected individuals with diabetes with an A1c of less than eight do not face a significant risk when compared with the rewards of surgery.[21–25]

Conclusion

Clinicians treating recalcitrant wounds should consider the patient's whole health picture, including issues like comorbidities, biomechanics, social supports and barriers to success. Regular foot checks and offloading are of vital importance and the standard of care for most patients. When conservative care fails, it may be appropriate to consider surgical offloading. ■

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