
Moulded Footwear: A Case Report

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Summary

Many methods of reducing pressure on the insensate foot, to prevent or heal plantar wounds, have been described. This article briefly examines some of these methods and outlines a modified version of one method applied to heal a chronic foot wound.

Introduction

Many wounds that occur on the insensate foot do so on the plantar aspect. Sensory loss increases the risk of ulcer formation, due to a lack of pain warning and loss of positional feedback¹. A review of foot wounds over a 20-month period at Fremantle Hospital's foot ulcer clinic (the clinic) showed that 66 per cent were on the plantar surface². Chronic wounds on the insensitive foot present a challenge to the practitioner and patients must be assessed correctly if they are to be managed successfully.

Guzman *et al*³ outlined the 'ideal' characteristics of successful pressure-relieving strategies as follows:

- provide effective pressure reduction from the ulcer at all times;
- have wide application to all patients;
- cause no side-effects or secondary lesions;
- are easily applied;
- encourage patient compliance;
- are cost-effective, and
- permit the pursuit of other treatment goals.

These strategies were applied to a chronic wound where the patient, although not diabetic, did suffer from significant sensory loss.

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Case history

Mr P, a 44-year-old Caucasian male, was born with his left leg in a reversed position. The leg was therefore amputated and re-anastomosed soon after birth. As Mr P matured, the damage to his lymphatic system left him with chronic non-pitting lymphoedema. His medical record showed he had received treatment for hypothyroidism, morbid obesity (he weighed 149 kg and was 167 cm tall) and chronic pulmonary heart disease.

There was also a 10-year history of recurrent foot and leg infections, with numerous hospital admissions for cellulitis, gangrene of the digits, amputation of digits and various plantar foot ulcers. The medical record also revealed allergies to septrin, zinc oxide, mercurochrome and calcium alginate dressings.

Mr P was referred to the clinic in March 1996 with an infected wound of approximately 3½ to 4 years' duration (see Figure 1). It was located on the plantar aspect of the left foot, over the base of the fifth metatarsal.

Recent treatment had consisted of drainage of a suspected focal soft tissue infection near the base of the fifth metatarsal, plus custom-made footwear with simple insoles. Dressings were limited to gauze and a Combine pad dressing to absorb the exudate.

Physical examination

Examination of the left foot revealed a wound 12.5 mm in diameter and approximately 20 mm deep, with a spongy, red base and deep undermining of the edges. A sinus tracking laterally to the surface was detected, but there was no bone in the base of the wound.

Notable, too, was the amount of superfluous tissue that had accumulated on the lateral aspect of the foot and was compressed against the foot during weight-bearing. The patient reported continuous exudate – varying from a clear to a reddish-brown fluid – from the wound. Significant sensory loss was

Figure 1. Left foot, showing plantar wound at base of fifth metatarsal.



noted on the left foot and pulses were not palpable, due to the extensive oedema. Limited ankle plantar/dorsi flexion was also recorded and past medical history revealed that the ankle had been fused. Amputation of digits two to four were noted. The skin had a ruddy appearance and the tissue was quite anhidrotic. The right foot had normal sensory levels and the ranges of motion were adequate.

Discussion

The aim in managing neuropathic wounds is to “[r]edistribute weight away from the ulcer” and “[r]educe the stresses that occur during gait and aid healing while allowing some mobility”⁴. A range of options to reduce pressure on the site were examined in the literature.

Total contact casting was not feasible, due to the severe oedema of the leg. An alternative contact casting method involved the use of an ethyl vinyl acetate moulded boot with an appropriate insole⁴.

The effects of custom-made shoes and insoles on this patient were evident⁵, as they had been of no value in reducing pressure over the area.

When the Cam Walker’s efficacy for the healing of plantar ulcers was reviewed⁶, the authors felt its bulk and weight might affect patient compliance, although, since it is easily removed, ease of dressing changes might be enhanced. However, this option was also rejected due to the chronic oedema.

Literature on the manufactured Half-shoe was also examined⁷. Seemingly, its most serious limitation was the need to use it in conjunction with crutches; the researchers advised that it should only be employed over short distances. Further, the angle of the forefoot placed the patient in an unsteady position.

The Scotchcast boot⁸ was lightweight and could be used for weight-bearing but did require skilled application. Some authors⁴ felt it also needed an overshoe and would probably require ongoing, skilled maintenance. Use of a wheelchair and crutches was ruled out because of the patient’s obesity.

The authors who compared total contact casting and felt and foam total contact padding³ believed these two methods met all the requirements of pressure-relieving strategies. However, the extent of the deformity present in this case did not make them easy to apply.

Fleischli *et al*⁹ measured the pressure-reducing capabilities of five types of treatment devices for plantar ulcers of the foot – total contact casting, the Darco Ortho Wedge and rigid-soled post-op shoes, the DH Pressure Relief Walker and accommodative felt and foam dressing – their premise being that effective pressure reduction aided healing. Their results revealed that the DH Pressure Relief Walker was as effective for pressure relief as the total contact cast, with the other three modalities significantly less likely to reduce forefoot pressure overall.

A moulded sandal described by Coleman and Plaia¹⁰ was referred to as the Carville sandal – thermoplastic materials were moulded to the foot and worn as a sandal, with the addition of soling materials and straps. The sandal was designed for use as temporary footwear on a healed foot, to minimise weight-bearing and prevent recurrence of the wound prior to the issue of appropriate footwear.

Method

Finally, a variation of the moulded shoe was devised¹⁰. Initially, a ‘foam box’ weight-bearing impression was used to create a negative mould of the foot. From this a positive cast

Figure 2. Positive cast (left) and foam box impression.



was poured (Figure 2). Then, two layers of 10 mm medium-density Plastazote were vacuum-moulded to the cast, with any excess material ground off to leave a flat sole. Lastly, non-skid soling material was added and velcro straps used to keep the

Figure 3. Patient's foot in sandal.



boot securely on the foot (Figure 3).

Having been in contact with the plantar surface of the cast, the lining of the shoe assumed the contours of the plantar surface of the foot. Thus, it became the accommodating surface necessary to reduce pressure over the site. The footwear comprised a shoe and insole combined, rather than a separate shoe and insole. This lessened the risk of an orthotic moving in the shoe, or of the foot moving away from the shoe and off the insole. The patient was very compliant with use of the shoe and his sedentary lifestyle meant there was not too much wear and tear on the lightweight materials.

The shoe was fitted on 15 November 1996 and by May 1997 the wound aperture had reduced from 12.5 to 2 mm. Further, the depth had reduced from 20 to 6-8 mm (Figure 4). A replacement shoe was issued on 27 June that year and, at a review on 25 July, the skin had remained intact for 2 weeks, with no discharge. The dressing strategy, which remained consistent over the healing period, permitted drainage from the wound. Meanwhile, a long-term footwear solution was still being investigated.

Figure 4. Left foot, showing plantar wound at base of fifth metatarsal 6½ months later.



Summary

Many options are available for the treatment and prevention of plantar foot wounds. This case history outlines an unusual situation and reinforces the need to tailor each wound care solution to the specific patient problem. A variation to a moulded shoe with insole has been shown.

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