

Custom foot orthosis offloading for the management of a plantar pressure foot ulcer

ME Moothee, SM Ntuli, C Vincent-Lambert
University of Johannesburg, South Africa
Corresponding author, email: mmoothee@uj.ac.za

<https://doi.org/10.36303/WHSA.0449>

Chronic ulcers carry a high rate of failure to heal. Pressure ulcers are classified as wounds primarily caused by pressure. Foot ulcers typically present with heavy callus formation in response to excessive pressure, hindering the healing process. Apart from wound management, which includes wound dressing and mechanical debridement, eliminating the causative factors is crucial for optimal wound healing. The healing of plantar pressure foot ulcers can be especially stubborn when not adequately offloaded. Amongst various forms of offloading, this case report focuses on using a custom foot orthosis for offloading a plantar pressure foot ulcer.

Keywords: pressure, ulcer, offloading, orthosis, management, foot

© Medpharm

Wound Healing Southern Africa 2024;17(2):41-43

Introduction

Chronic wounds are “wounds that fail to proceed through the normal phases of wound healing in an orderly and timely manner.” These wounds include diabetic foot ulcers, venous leg ulcers, pressure ulcers, and arterial ulcers. Ulcers occur where a predisposing condition impairs the ability of the tissue to maintain its integrity or heal from damage. Ulcers may present as superficial or deep, extending to the bone, and may track under the tissue so that an extensive area of damage is not visible on the skin’s surface (Table 1). Pressure ulcers often develop because of persistent mechanical stress.¹

Table 1: Characteristics of pressure ulcers on the foot²

Location	Posterior aspect of the heel, plantar aspect of the foot, and malleoli
Shape	Round, or irregular if large
Depth	Shallow to deep
Margins	Variable
Base	Variable
Surrounding skin	Variable
Pain	Often painful

Foot orthoses are in-shoe medical devices designed to alter the magnitudes and temporal patterns of the reaction forces acting on the plantar aspect (and other aspects) of the foot.³ This allows more normal foot and lower extremity function, and decreases pathologic loading forces on the structural components of the foot and lower extremity during weight-bearing activities.³ Offloading refers to minimising or removing weight on the foot to prevent and heal ulceration.^{1,2} The evaluation of a pressure foot ulcer should include an evaluation of the need to offload. This includes a gait analysis and checking for any underlying bony prominences.⁹ For plantar foot ulcers, healing can be

delayed, especially when not adequately offloaded. Achieving effective pressure relief (offloading) is critical to promoting foot ulcer healing.⁴ Podiatrists manufacture custom-made foot orthoses for effective pressure redistribution (offloading), which is essential for achieving optimal healing of pressure ulcers.

Case report

A 33-year-old male presented with a painful pressure ulcer on the plantar aspect of the second metatarsal head of his right foot. The patient reported being on vacation and walking on the hot paving surrounding the swimming pool. He mentioned that he later noticed a blister underneath his foot and assumed it resulted from contact with the hot paving. The blister eventually ruptured and further deteriorated into a wound. Other than a history of gout, the patient was generally healthy.

The patient initially developed the foot ulcer in September 2013 and had been struggling to heal the ulcer for approximately 12 months, consulting general practitioners back and forth for wound redressing. In September 2014, the patient presented at a private practice (podiatrist) with a chronic non-healing pressure ulcer on the plantar aspect of the right foot. The periwound skin was heavily calloused and macerated. The wound edge was irregular, with a wound measurement of 30 × 30 × 10 mm (depth). The wound bed was red, with minimal slough present. The patient reported pain and heavy exudations (Figure 1).

Further investigation included a biomechanical assessment, which discovered that he had a pes cavus foot type. He was treated with frequent scalpel debridement, and the wound was dressed with Drawtex® (Drawtex®, South Africa) dressing. Drawtex® is a hydroconductive wound dressing that draws out exudate and prevents maceration. Template measurement was taken, and a custom foot orthosis (simple insole with a “U” cut-out plantar metatarsal pad) was



Figure 1: Plantar pressure foot ulcer (30 × 30 × 10 mm [depth]) at the initial podiatric consultation



Figure 2: Marked improvement (10 × 2 × 1 mm [depth]) following podiatric wound management and orthosis offloading

manufactured for the patient during his first consultation to offload the wound. The patient had not received any offloading before his consultation with the podiatrist. The materials used to manufacture the custom foot orthosis were ethylene vinyl acetate with a durometer of 20–25 and Poron covering. These materials (soft and flexible) are primarily used for palliative devices.

The patient returned every two weeks for scalpel debridement and wound redressing. The patient was compliant with the use of the custom-made orthosis, which significantly reduced the amount of callus buildup at every consultation. The wound showed good progress in healing as the wound size (10 × 2 × 1 mm [depth]) decreased significantly (Figure 2).

After six months of continuous podiatric wound management and offloading with the custom foot orthosis, the plantar pressure foot ulcer had completely healed with hyperkeratotic scarring (Figure 3). The patient was discharged and was instructed to continue using the custom foot orthosis (Figure 4).



Figure 3: Plantar pressure foot ulcer completely healed with hyperkeratotic scarring after six months



Figure 4: Custom-made foot orthosis manufactured for offloading

Discussion

A holistic approach is required in the assessment and management of chronic wounds. The initial assessment of the wound begins with observing the patient's general health status and considering the holistic potential for wound healing. A comprehensive patient history follows to identify any medical comorbidities and contributing factors, such as previous ulceration or the presence of systemic disease. In this case report, the patient was generally healthy apart from having gout. One would expect most wounds to be predisposed by a systemic condition, as with diabetes. Interestingly, this patient's foot type may have been a causative factor for the wound to deteriorate for 12 months.

Assessments are conducted to identify any factors that may hinder the healing process of the ulceration. Management of all chronic wounds is primarily according to the aetiology and site. It is critical to identify medical comorbidities that may be a predisposing factor to ulcer development or may even be a hindering factor for wound healing. Depending upon the aetiology of the wound, revascularisation may be necessary. Sites of increased mechanical stress must be protected and offloaded with padding, orthoses, or footwear modifications.⁵

Before the patient's podiatry consultation, a biomechanical assessment was not performed; hence, the patient's foot type had not been

identified. Often, wound redressing becomes a priority for patients presenting with wounds and special investigations are not considered. To identify all factors that may hinder the healing of a wound, it is imperative that the health practitioner undertakes a holistic approach to assessment rather than just a wound assessment. This should include a multidisciplinary approach.

Generally, chronic wounds can take weeks to months to heal, and some may take years. It is important to eliminate the barrier of wound healing, which is often pressure, when effectively managing a plantar pressure foot ulcer.⁶ In this case report, the foot type was highlighted as the causative factor for the uneven pressure on the wound. The patient had a pes cavoid foot type, described as a high-arched foot.²⁹ This type typically has an uneven pressure distribution in a tripod fashion and the ball of the foot and heel area are high-pressure points.²⁹

Foot orthoses are used for a range of clinical symptoms; however, underlying these symptoms are three biomechanical objectives: 1) to alter foot motion; 2) to alter stress experienced by internal hard and soft tissues; and 3) to alter the distribution and magnitude of load applied to the plantar surface.⁷ Podiatrists manufacture custom-made foot orthoses designed to provide pressure relief (offloading), which is an integral part of managing plantar pressure foot ulcers.⁸

Conclusion

Plantar pressure foot ulcer prevention and management remains a challenging area in tissue viability. Emphasis on introducing offloading early in plantar pressure foot ulcer management is imperative for wound healing and will ultimately improve the clinical outcome and well-being of the patient. This case report highlights the importance of effective pressure redistribution (offloading) and a multidisciplinary approach in wound management.

Conflict of interest

The authors declare no conflict of interest.

Funding source

No funding source to be declared.

Ethical approval

Informed consent was obtained from the patient.

ORCID

ME Moothie  <https://orcid.org/0000-0003-0592-7027>

SM Ntuli  <https://orcid.org/0000-0003-0930-1734>

C Vincent-Lambert  <https://orcid.org/0000-0002-7312-6654>

References

1. Lehman JD. Chronic wound management. In: Tower DE, editor. Evidence-based podiatry. Springer: Cham; 2020. p. 221-3. https://doi.org/10.1007/978-3-030-50853-1_12.
2. Menz HB. Foot problems in older people: assessment and management. United Kingdom: Churchill Livingstone; 2008. p. 130. <https://doi.org/10.1016/B978-0-08-045032-2.X5001-4>.
3. Landorf KB, Cotchett MP, Bonanno DR. Foot orthoses. In: Burrow JG, Rome K, Padhiar N, editors. Neale's disorders of the foot and ankle. 9th ed. Oxford: Elsevier; 2020. p. 555-6. <https://doi.org/10.1016/C2013-0-19207-0>.
4. Ousey K, McIntosh C, editors. Lower extremity wounds: a problem-based approach. Chichester: John Wiley and Sons; 2007. p. 177. <https://doi.org/10.1002/9780470697870>.
5. Powers JG, Higham C, Broussard K, Phillips TJ. Wound healing and treating wounds: chronic wound care and management. *J Am Acad Dermatol*. 2016;74(4):607-25. <https://doi.org/10.1016/j.jaad.2015.08.070>.
6. Berlowitz D. Incidence and prevalence of pressure ulcers. In: Thomas D, Compton G, editors. Pressure ulcers in the aging population. Totowa: Humana Press; 2014. https://doi.org/10.1007/978-1-62703-700-6_2.
7. Williams AE, Nester C. Pocket podiatry: footwear and foot orthoses e-book [Internet]. New York: Churchill Livingstone; 2010:29-56. <https://doi.org/10.1016/B978-0-7020-3042-0.00007-5>.
8. Jones AD, Russell DA. Foot deformity and pressure management in the diabetic foot. In: Shearman CP, Chong P, editors. Management of diabetic foot complications. Springer: Cham; 2023. https://doi.org/10.1007/978-3-031-05832-5_14.
9. Watkins J. Basic biomechanics of gait. In: Burrow JG, Rome K, Padhiar N, editors. Neale's disorders of the foot and ankle. 9th ed. Oxford: Elsevier; 2020. p. 146. <https://doi.org/10.1016/B978-0-7020-6223-0.00007-8>