Management of Diabetic Foot Ulcers with Two Forefoot Offloading Techniques

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Background

Offloading, tapered mobility, appropriate footwear, patient education, and routine self-assessment are key to the prevention and recovery of a mechanically induced diabetic foot ulcer (DFU).[1,2] The International Working Group on the Diabetic Foot (IWGDF) guidelines recommend a non-removable knee-high device for primary treatment of a non-ischemic, uninfected, neuropathic, plantar forefoot ulceration.[2,3] Removable knee-high devices and ankle-high offloading are recommended as the 2nd tier in the event of contraindication or limited tolerance of tier 1 modalities.[4-6] However, many studies have shown poor patient compliance, delayed healing, and suboptimal outcomes with the use of removable offloading devices.[1-3] Tertiary recommendations include a felted foam application in conjunction with suitable footwear.[4-6]

Literature is limited on the football and felt dressings, and requires additional exploration to evaluate their efficacy, cost-benefit, and patient tolerance to determine their value as alternative offloading modalities. Our aim is to examine alternative offloading dressings when 1st tier modalities are not tolerated by the patient.

Methods

Two patients with diabetic plantar forefoot ulcers were selected. One patient was managed with the use of the football offloading dressing, and the other patient with a modified felted football dressing.

Treatments

A **modified felted football** has an adhesive foam padding custom cut to the traced patient foot outline. A hole, 0.5cm larger than the diameter of the wound is cut out. After primary dressings are applied, tincture of benzoin is applied to intact skin of the plantar foot and the felt adhesive is adhered.

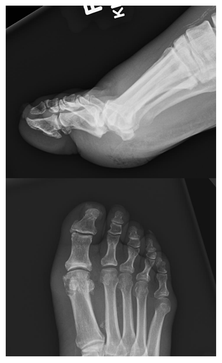
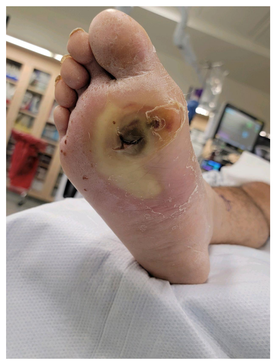
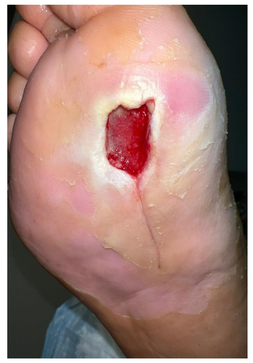
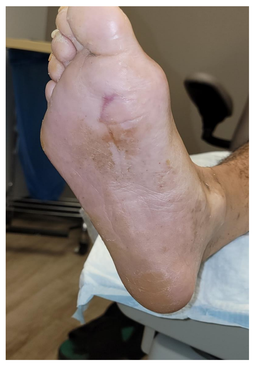
A **football** offloading dressing, overlying primary wound dressings, includes folded layers of 3 rolls of 4-inch cast padding overlying the dorsal and plantar forefoot.[7]

Both dressings are followed by interdigital cotton cast padding strips. A 4-inch cast padding is wrapped around the forefoot and up to 2-3 inches above the ankle joint.[7] Followed by a non-compressive, 4-inch, self-adhesive wrap applied to the entire dressing.[7] A non-compressive, 4-inch cotton, tubular stockinette bandage is applied. An offloading diabetic healing (DH) shoe is administered.

Patients are encouraged to use adaptive equipment to maximize offloading with ambulation. The dressings are designed to be non-removable, with preserved ankle mobility, and are typically in place for 1 week.

Case Presentations & Clinical Course

Case 1

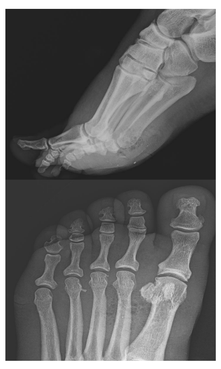
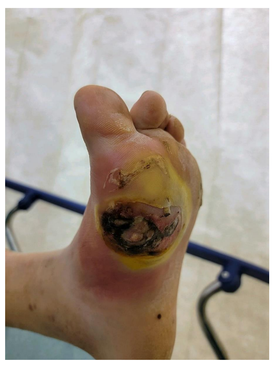
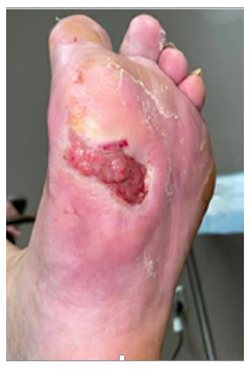
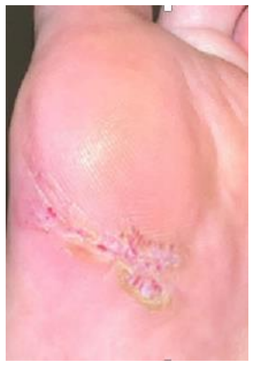





Case 1
47-year-old male with uncontrolled DMT2, peripheral neuropathy, HTN, HLD, and tobacco use with an infected, necrotic ulcer on the right 1st plantar MTPJ following a puncture wound. Patient works in construction.

Presented with a necrotic wound, fluctuance, erythema, edema, calor, and purulence. He presented febrile, tachycardic, and with leukocytosis. Radiographs and MRI revealed an abscess and 1st MTPJ sepsis. He was admitted, antibiotics were initiated, and underwent an operative I&D.

After surgical source control, was treated with 6 weeks of culture-directed antibiotics. He was treated with NPWT for 2 weeks, then transitioned to a weekly **modified felted football** offloading dressing with a DH shoe. At 8 weeks, his wound was completely healed.

Case 2

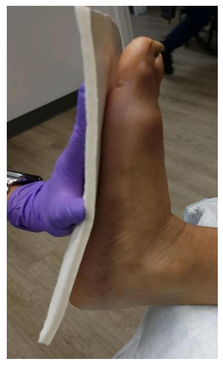
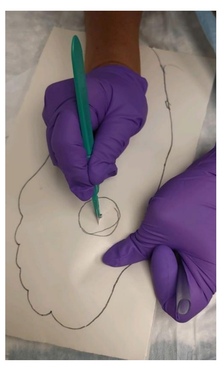





Case 2
52-year-old female with uncontrolled DMT2, peripheral neuropathy, schizophrenia, and seizure disorder with an infected ulcer on the left 1st plantar MTPJ. Patient reports walking up to 80 miles per week, sometimes barefoot.

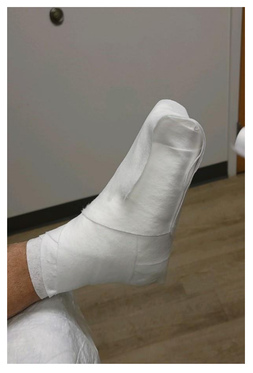
Presented with full-thickness necrosis, fluctuance, erythema, edema, calor, and purulence. She presented afebrile, and with stable vital signs. Radiographs revealed concerns for emphysematous gangrene. She was admitted, antibiotics were initiated, and underwent an operative I&D.

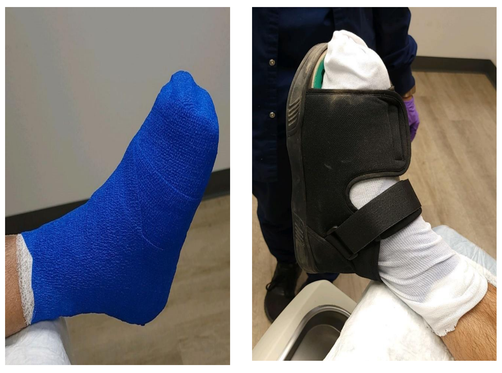
After surgical source control, was treated with 4 weeks of culture-directed antibiotics. She was treated with NPWT for 4 weeks, then transitioned to a weekly **football** offloading dressing with a DH shoe. At 9 weeks, her wound was completely healed.

Modified Felt

Football



Literature Review

Over 100 million Americans have diabetes or prediabetes; 19-34% of them are likely to develop a DFU with an estimated 40% to 65% ulcer recurrence, and 8 times higher risk of major limb amputation.[1,8-11] General 1-year post-amputation mortality rates are estimated up to 40%, and up to 80% at 5 years; overall mortality rates for major limb amputations exceed that of most cancers.[12,13]

Eliminating repetitive tissue trauma, shearing forces, friction, and prolonged pressure with offloading is crucial for healing DFUs.[1,2,10] Irremovable knee-high offloading devices are the gold standard treatment with superior plantar tissue offloading.[4,5,14] When 1st tier modalities are not tolerated, shared decision-making is crucial for identifying the appropriate offloading modality to support their comfort, safety, and tolerance, and promote adherence adapted to their ambulatory choices.[6,15]

Several offloading devices are available for pressure redistribution to aid in the management of DFUs. Ankle-high offloading devices are often tolerated by patients and have shown a comparable healing potential to knee-high offloading with appropriate patient compliance.[14] The football offloading dressing was initially reported by Rader and Barry in 2006 as an alternative with increased supply availability, cost savings, and shorter duration of application while maintaining a non-removable status.[7]

Football dressings have historically provided moderate offloading with improved patient compliance and satisfaction, but the literature on football offloading dressings or soft casts is not robust and is not included in the guidelines.[7,14,16,18] Felted foam application with a wound aperture combined with offloading footwear, has shown modest plantar pressure reduction when not condensed from weight over time, is not well represented in literature, and is in the lowest tier of IWGDF recommendations.[4,5,18-20]

Discussion & Conclusion

Offloading is pertinent to optimal healing and protection of DFUs that pose a significant risk for loss of limb or life. Additional consequences include frequent and prolonged hospital admissions, profound cost of care, frequent follow-up and specialty visits, interference with mobility and independence, high morbidity and mortality, socioeconomic decline, and suboptimal quality of life.

Patient compliance and satisfaction with treatment modalities play a significant role in healing potential and long-term outcomes. Patients may struggle with tolerating gold-standard treatment and often have poor healing with removable devices.

Investigating non-removable devices that allow for adequate offloading with improved mobility, independence, and tolerance is important in identifying alternative modalities. Research has shown increased patient satisfaction and compliance with dressings that allow continued ankle flexion and mobility, supporting a more detailed investigation into alternative dressings such as the football offloading and the modified felted football offloading dressings.

The football and modified felted football offloading dressings may provide a hybrid alternative, maintaining ankle mobility and non-removability when patients do not tolerate other modalities. Successful alternative offloading may contribute to optimal healing and prevention of major limb amputations and their overwhelming consequences. These dressings have shown positive clinical outcomes for our patient population when 1st tier modalities were not tolerated.

Further high-quality studies would be recommended to confirm the success and efficacy of these alternative offloading dressings.

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