

Remote Temperature Monitoring to Prompt Timely Preventative Debridement



U.S. Department of Veterans Affairs

Veterans Health Administration

Southern Arizona VA Health Care System (SAVAHCS)

A Case Series of Two Patients

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Introduction

Diabetic foot ulcers (DFUs) contribute to significant morbidity, mortality, and resource utilization. An important causal pathway for the development of DFU is callus, which can increase localized plantar pressures by as much as 30% [1]. This high localized plantar pressure can result in repetitive microtrauma to subcutaneous tissue, enzymatic autolysis, subcutaneous hemorrhage, and, ultimately, DFU [2-4].

Debridement is an important therapy for the prevention and treatment of DFU. Multiple practice guidelines [2-5] recommend treatment of all pre-ulcerative lesions, including callus. Research suggests that debriding callus may be a more effective intervention for reducing peak plantar pressure than other forms of offloading, such as reduced ambulation, accommodative footwear, or Achilles tendon lengthening [1, 6].

Unfortunately, patients at risk for DFU are often insensate due to peripheral neuropathy. These patients also tend to be non-compliant with daily foot self-exams, and those who are compliant often have poor visual acuity secondary to diabetic retinopathy [3]. This confluence of factors can potentially result in delayed identification and treatment of hyperkeratotic, devitalized, and necrotic tissue that would benefit from debridement in accordance with clinical practice guidelines.

We hypothesize that thermometry may be a useful tool for the early identification of inflammation due to callus, and that its practice may enable early and timely debridement to mitigate the progressive tissue damage that may otherwise go undetected.

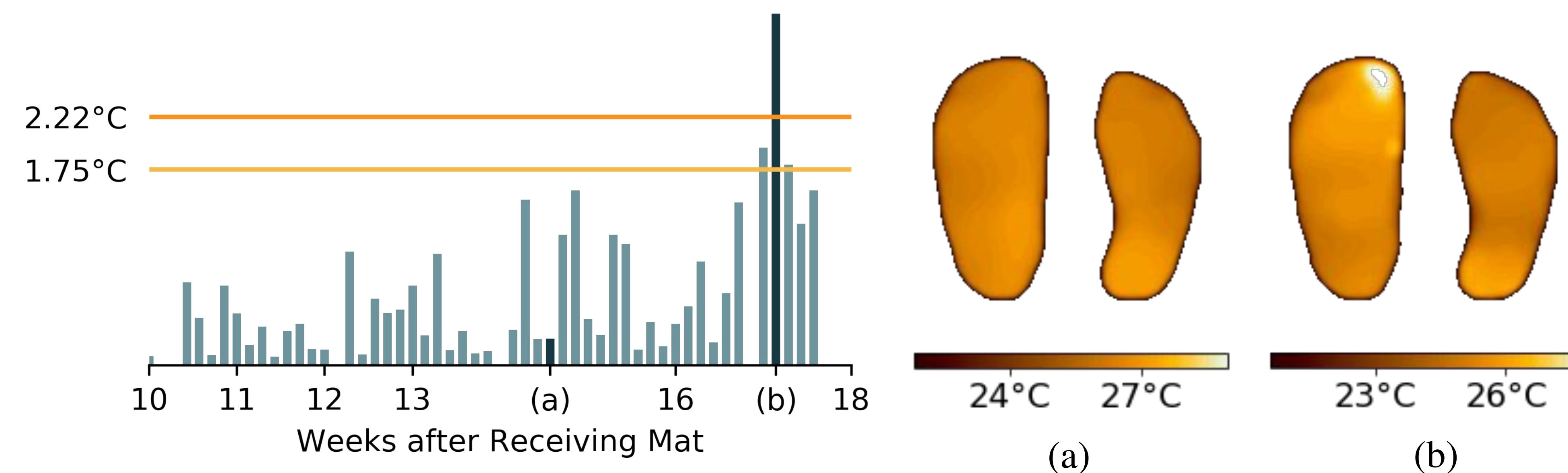
Methods

This case series follows two high-risk veteran subjects who receive care in a high-risk podiatry clinic. These subjects have been prescribed a telemedicine thermometry mat (RTM System; Podimetrics, Somerville MA) for preventative foot care. A recent study suggests that this mat may predict as many as 97% of non-traumatic plantar DFU with an average lead time of five weeks [7].

These subjects recently presented with hotspots, or locations with persistent differences between the left and right foot temperatures exceeding 2.2°C. Consistent with the clinic's protocol, each was contacted in response to the hotspot to collect subjective history, and upon further triage, both hotspots were found to coincide with callus.

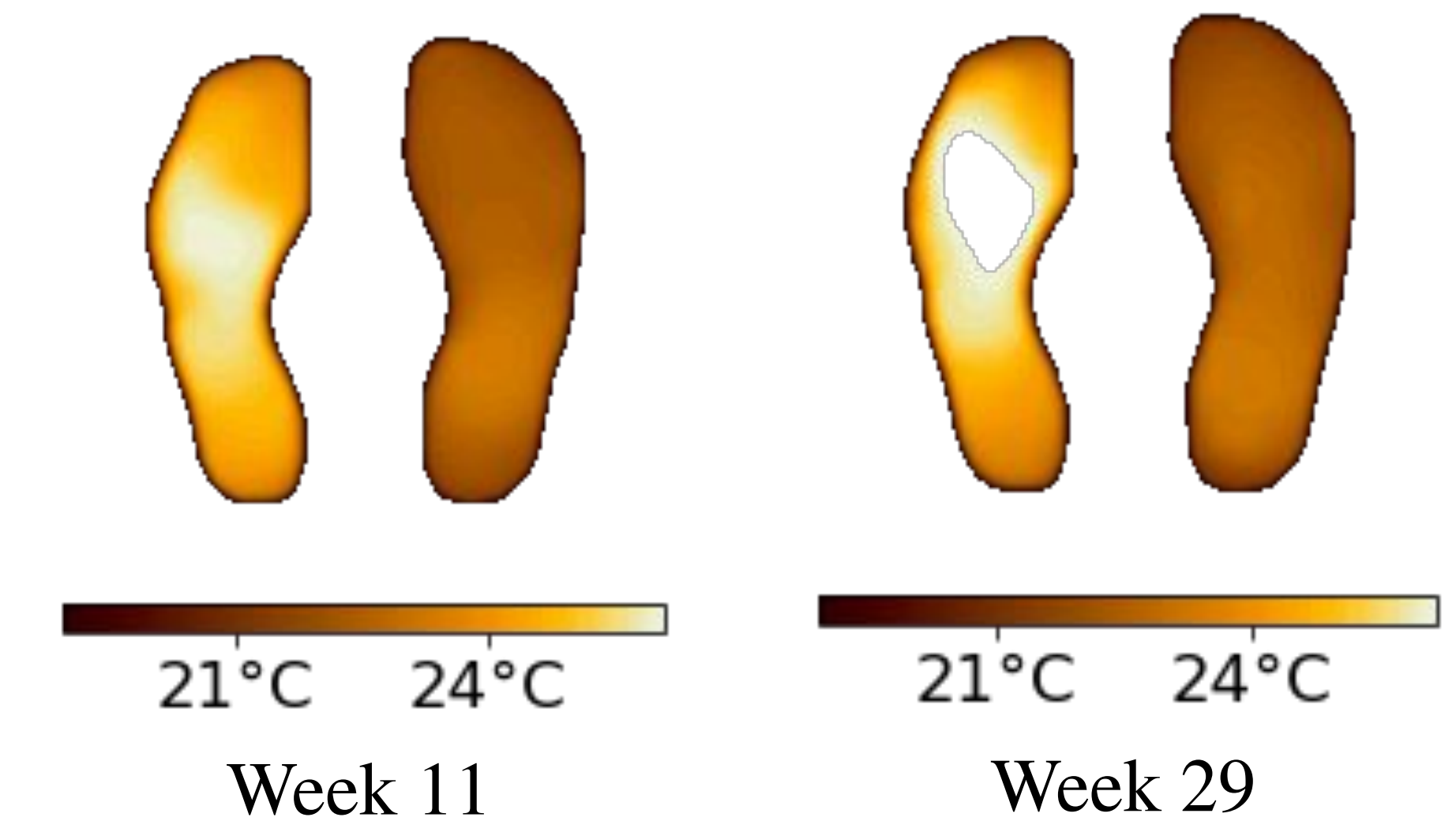
Case 1

- 70 year old male with bilateral Charcot arthropathy and recurrent DFU to the right 3rd digit.
- Approximately ten months after healing from most recent DFU, subject was issued the thermometry mat. He remained hotspot-free for four months.
- During month four, thermometry detected inflammation to the right plantar hallux. During outreach, subject admitted to neglecting daily foot self-exams and was educated on importance of self-exams for preventative care.
- Subject denied any calor, edema, callus, or DFU upon self-exam. Although his next appointment was in two months, he denied an earlier clinical exam, and a consult was written for routine replacement of the subject's diabetic shoes.
- The following day, subject called the clinic and reported that his wife, who was assisting in his daily foot check, had noticed a wound to the plantar aspect of the right hallux. Subject had no DFU history to his right hallux and therefore he had not previously considered it an area of concern.
- Upon clinical exam the next day, a superficial wound measuring 0.7 x 0.7cm without any signs of infection was debrided and treated.
- The wound was found healed upon debridement of callus during a follow-up exam three weeks later. Subject has remained hotspot and DFU-free since healing.
- **Thermometry resulted in timely outreach and increased compliance with daily foot checks during a period of elevated risk. This potentially explains the low severity of the DFU at presentation and enabled healing within three weeks without use of costly advanced therapies.**



Case 2 (continued)

- During the most recent call, subject reported recurrent callus. During follow-up clinical exam the next week no wounds were found upon debridement.
- **Thermometry led to prompt outreach, and the inflammation was likely due to the patient's recurrent callus to a known area of concern. Offloading and debridement resolved the cause of the inflammation detected by the mat, potentially contributing to the subject remaining DFU-free over the past eleven months.**



Conclusion

We present two cases in which thermometry was used to identify pre-ulcerative callus, allowing for timely debridement and relief of plantar foot pressures. Practice of thermometry may enable timely and tailored offloading interventions such as debridement, which has the potential to improve preventative care and reduce DFU-related morbidity, mortality, and costs.

Case 2

- Subject with prominent right 5th metatarsal head that results in frequent pre-ulcerative callus.
- Subject has history of infection to this location requiring two previous hospitalizations, the most recent of which was for a 4.1 x 2.7 x 1.2cm DFU with a 0.9cm tunnel.
- Metatarsal head resection was considered, but the infection had not progressed to osteomyelitis. Subject ultimately elected not to undergo surgery.
- Subject was prescribed the thermometry mat for preventative foot care as part of a limb-salvage effort a year after healing from the most recent DFU.
- During the nearly eight months he's been monitored, he has had two hotspot episodes with inflammation localized at the right 5th metatarsal head. Each hotspot resulted in communication with the patient for foot inspection. The subject reported callus during each call, for which offloading and increased diligence were instructed.

References

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