

Bridging Technology and Clinical Judgement: Advancing Early Infection Detection and Wound Care Decision Making

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INTRODUCTION

- Early recognition of infection and inflammation significantly improves wound healing outcomes¹
- Conventional wound assessment relies subjectively on visual evaluation and clinician experience¹
- Growing evidence has shown improved outcomes with objective wound assessment tools to supplement clinical evaluation and standardize documentation²⁻³
- Non-invasive imaging using infrared thermography (IRT) can detect tissue changes and inflammation before these are clinically evident or symptomatic³
- Bacterial fluorescence imaging (BFI) can further enhance assessment by detecting bacterial load within and surrounding the wound³
- Use of these imaging technologies with clinical judgement, has shown promise in early detection of complications and improving wound healing outcomes³

OBJECTIVES

1. Evaluate the ability of IRT and BFI for the early detection of inflammatory changes and wound infection
2. Assess the clinical utility of IRT and BFI in objective wound assessment when used with routine clinical examination
3. Evaluate how imaging-derived findings can inform wound management, including culture collection, dressing selection, and debridement.

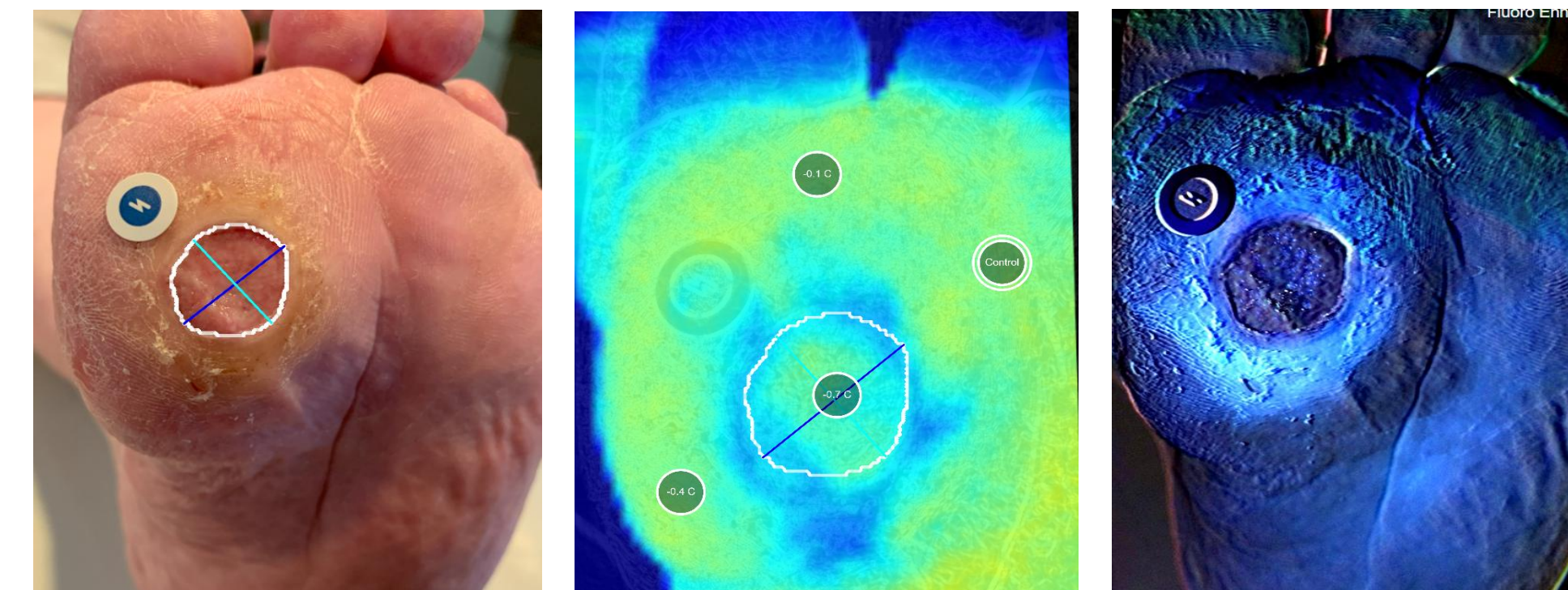
METHODS

- Study design: prospective observational cohort study at two outpatient clinics
- Twenty chronic wounds (diabetic foot ulcers (DFU), venous leg ulcers, pressure injuries, and traumatic wounds) were followed
- IRT and BFI imaging was performed at every visit (every 1-2 weeks) and imaging results were used to support with routine clinical examination and decision making
- Representative cases were selected to demonstrate how IRT and BFI data influenced dressing selection, culture timing, and antimicrobial management

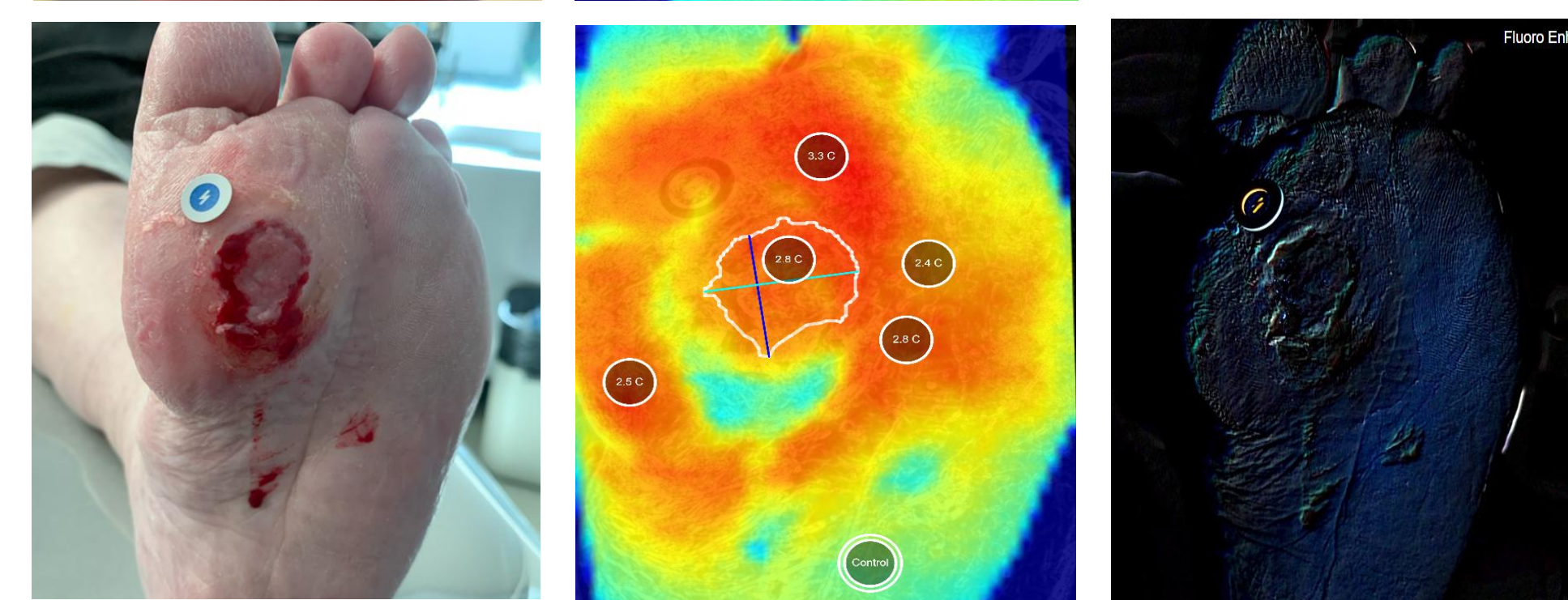
RESULTS

CASE 1:

Baseline
(Week 1)



Follow-up
(Week 2)



Row 1: Baseline (Week 1)

- IRT: temperature variations (peri-wound area)
- BFI: early biofilm activity (peri-wound area)

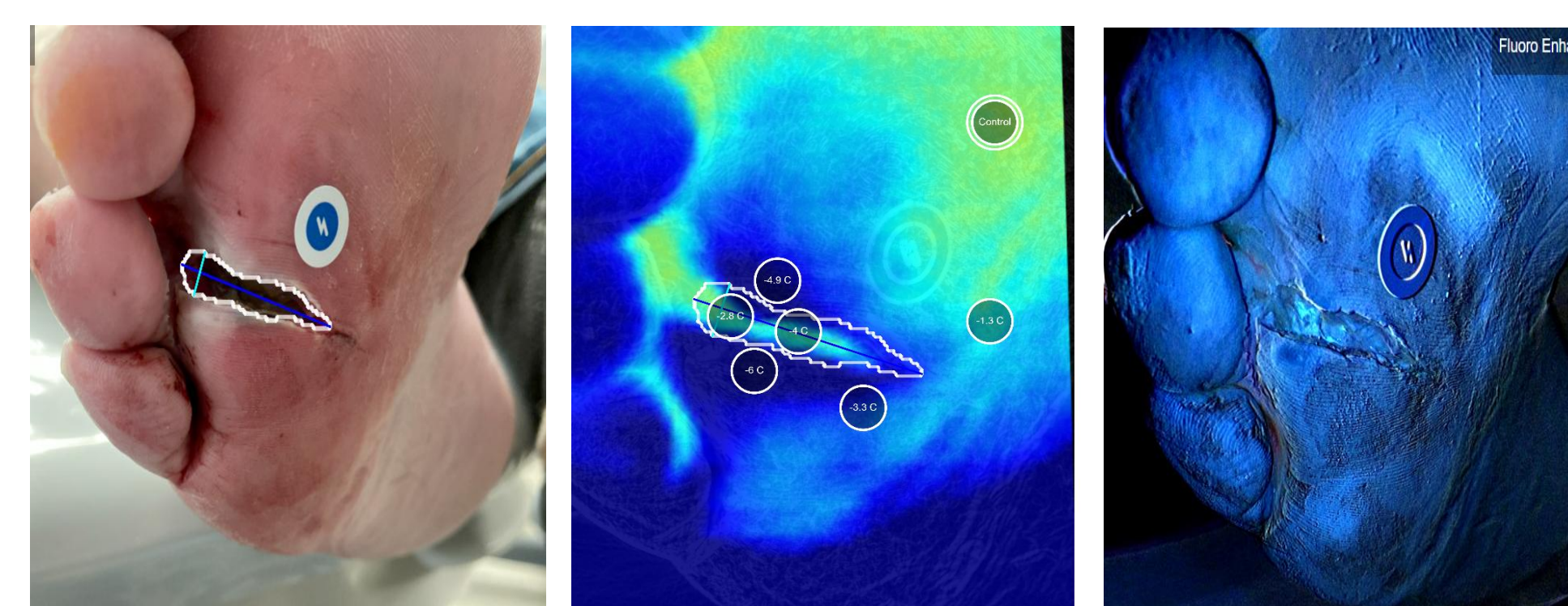
Row 2: Follow-up (Week 2) - Early Changes Detected

- Wound is clinically stable on visual examination
- IRT: localized temperature elevations suspicious for inflammation and infection
- BFI: ongoing biofilm activity (wound margins)

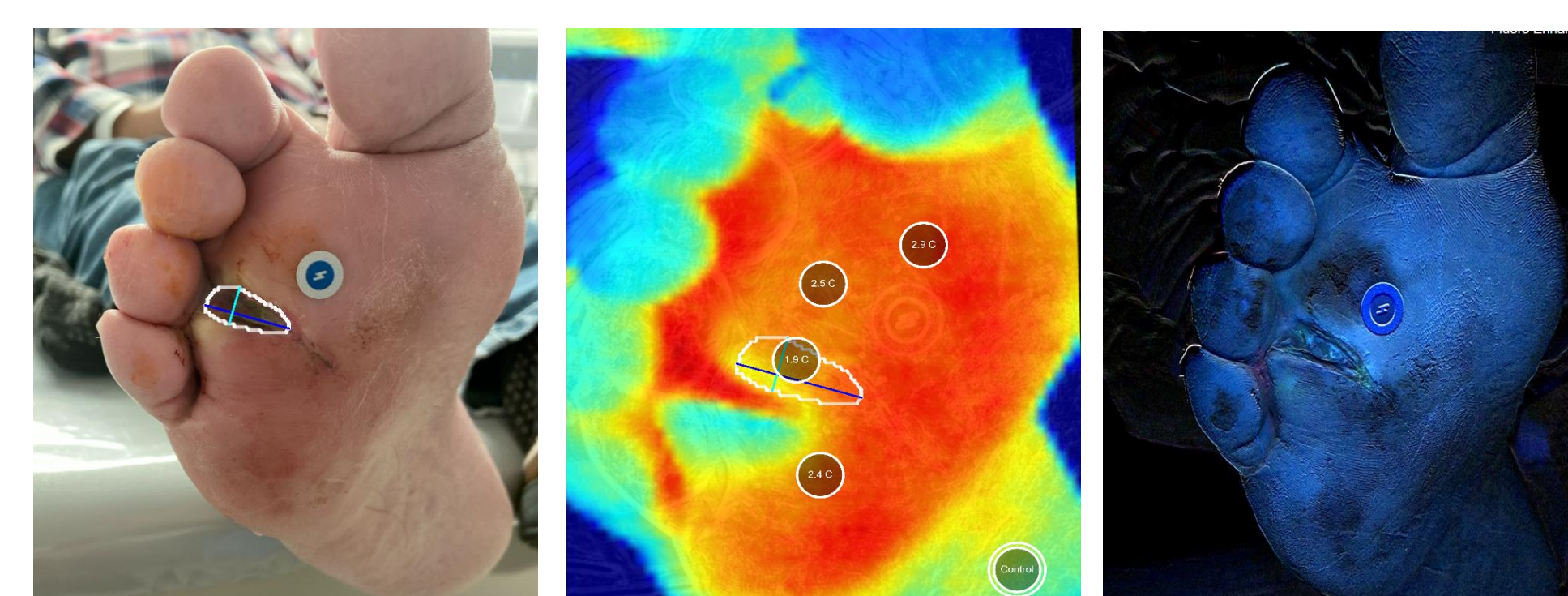
IRT and BFI with clinical exam prompted early intervention with wound culture, dressings, and antibiotic therapy

CASE 2:

Baseline
(Week 1)



Follow-up
(Week 2)



Row 1: Baseline (Week 1)

- IRT: temperature irregularities (peri-wound area)
- BFI: biofilm activity (wound area)

Row 2: Follow-up (Week 2) - Early Changes Detected

- Wound is clinically stable with slight reduction in size
- IRT: diffuse temperature elevations suspicious for early infection (peri-wound area)
- BFI: increasing biofilm activity (wound bed)

IRT and BFI with clinical exam prompted early intervention, including wound culture. The wound culture was positive and targeted antibiotic therapy was initiated.

RESULTS

- Infrared thermography (IRT) and Bacterial fluorescence imaging (BFI) imaging facilitated early recognition of wound infection and biofilm accumulation in selected cases
- In these DFU cases, IRT imaging revealed a 2.6°C peri-wound temperature increase while BFI detected biofilm activity at the wound edges, prompting early wound culture confirming infection.
- IRT and BFI with clinical assessment prompted further changes in clinical management, including dressing selection and the use of selective debridement
- Altogether, IRT and BFI imaging tools supported earlier detection and adjustments to wound management

DISCUSSION

Imaging with IRT and BFI can detect early signs of inflammation and infection to support clinician assessment and treatment decision making.

Broader clinical validation with studies of larger and more diverse sample sizes is still needed to strengthen the evidence base for the integration of these imaging tools in routine wound assessment and decision making.

However, IRT and BFI tools have strong and growing evidence of their potential to be a valuable support to routine wound assessment by providing objective physiologic data that is not visible on clinical exam.

REFERENCES

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3. Ramirez-GarciaLuna JL, Martínez-Jiménez M, Fraser RDJ, et al. Is my wound infected? A study on the use of hyperspectral imaging to assess wound infection. *Front Med (Lausanne)*. 2023;10:1165281.