

Introduction of Problem

Skin is an indicator of general well-being as it mirrors our internal health. A visual skin assessment is the gold standard in detecting problems. Classic signs of skin abnormalities include visual and tactile changes such as redness, bruising, warmth, cold, edema, induration, and inability to elicit a blanching response. Visual Assessment and early recognition of skin changes in darkly pigmented skin can be more challenging than in lighter skin tones and result in not capturing important assessment findings.

Rationale

An inflammatory response may cause elevated tissue temperature resulting in increased thermal energy differentials. This may be a result of a concomitant active metabolic bacteria or an abnormal physiologic response. Conversely, hypoperfusion may cause decreased tissue temperatures which result in decreased thermal energy differentials.

Methods

Methods: Long Wave Infrared Thermography (LWIT) images were taken as an assessment adjunct on 7 darkly pigmented patients. The Infrared camera measures the energy being emitted from the human body which is translated into a temperature gradient producing a colorful image with an objective temperature in degrees Celsius. It also detects energy emitted in electromagnetic waves not visible to the human eye in the range of 8-14 microns in wavelength. The radiation the human body emits is 12 microns. Selecting a control point to adjacent healthy tissue provides a relative temperature removing intrinsic and extrinsic variables.

Results

LWIT thermal images provide advanced assessment of darker skin based on increased/decreased thermal energy which supports the recognition of inflammatory/infectious or hypoperfused presentations in the 7 cases studied.

Conclusion

LWIT is a powerful, real-time, non-contact, bedside tool that allows clinicians to advocate for patients. Historically, research has shown that assessing darkly pigmented skin is a visual challenge and adding LWIT as an assessment adjunct can improve patient outcomes by providing objective, quantifiable data that is based on relative temperature.

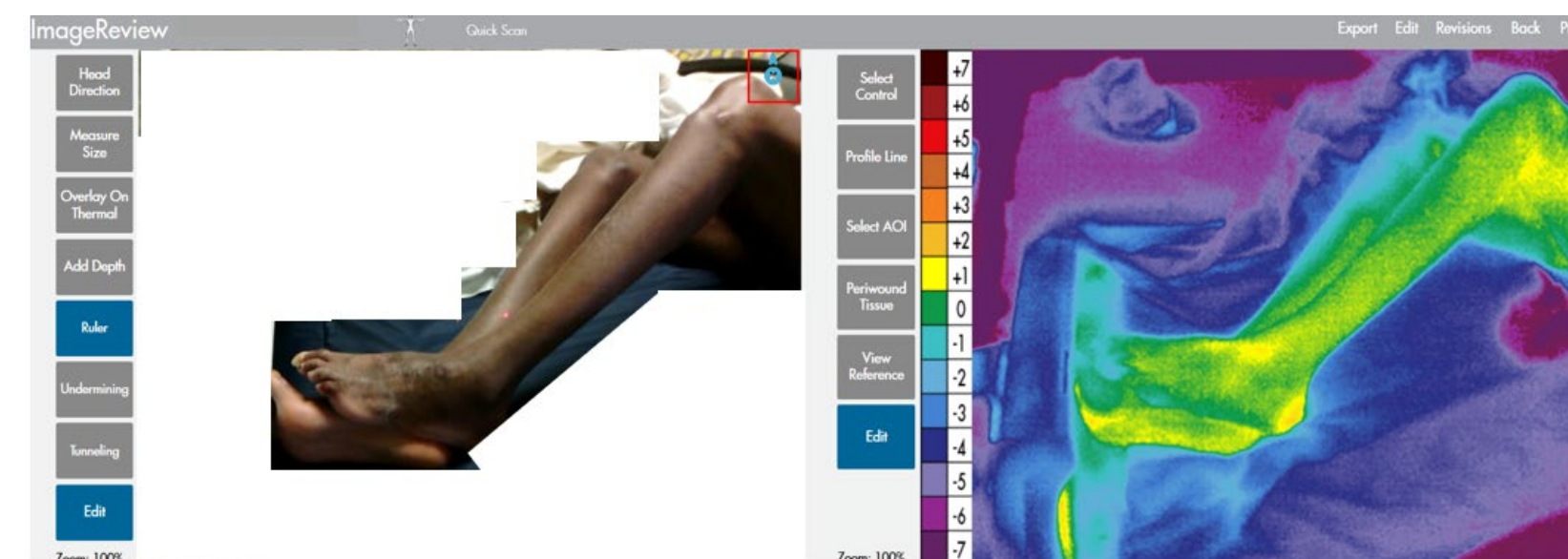
References

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Early Detection of Darkly Pigmented Skin Abnormalities with Long Wave Infrared Thermography: It's All Relative!

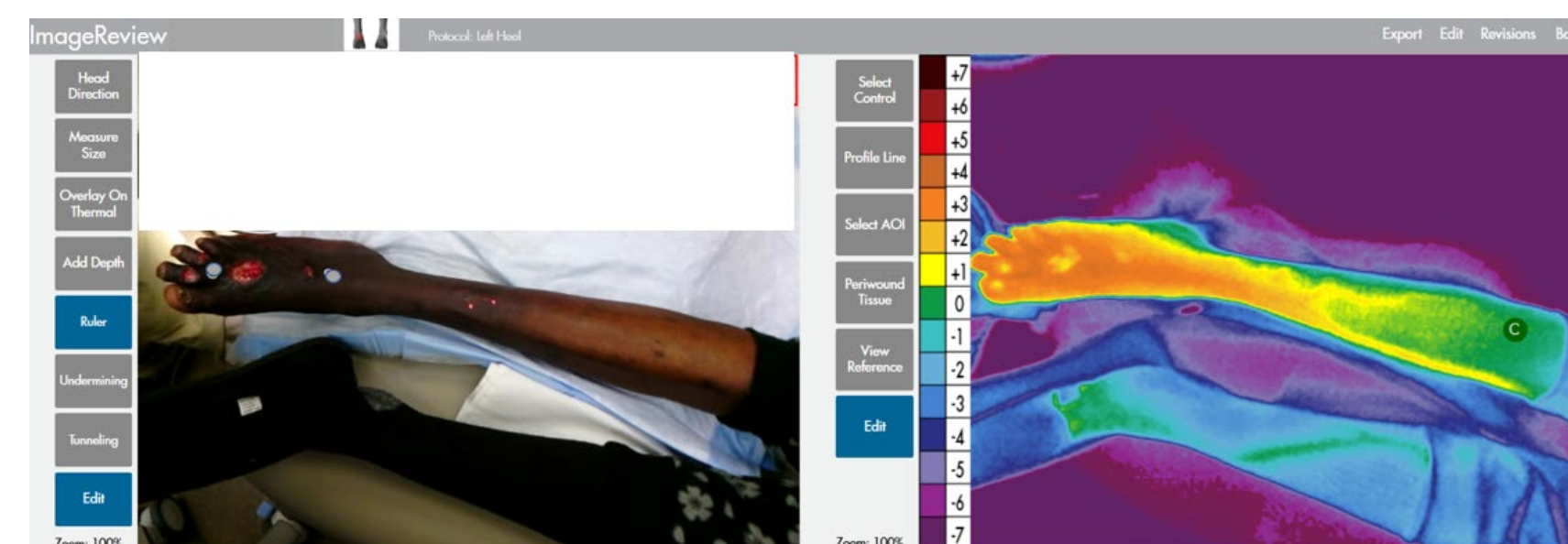
Case # 1 Normal Visual and Thermographic Images

Institutionalized elderly patient at risk for pressure injuries was imaged with LWIT device. Image review revealed no abnormal thermal findings-within normal limits.



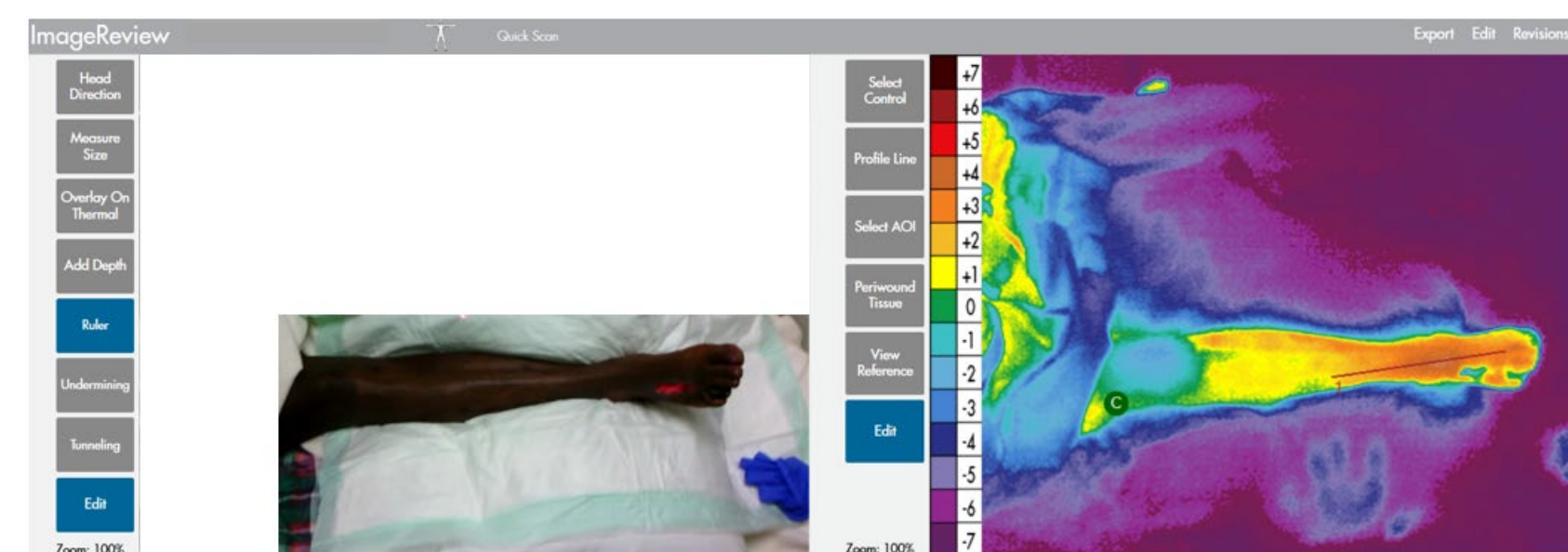
Case # 2 Atypical and Infection

49-year-old patient with Type 1 Diabetes Mellitus (DM), a hard-to-heal wound, LWIT showed increased thermal energy/pattern which led to additional testing including a positive culture and biopsy which resulted in an atypical vascular ulcer diagnosis.



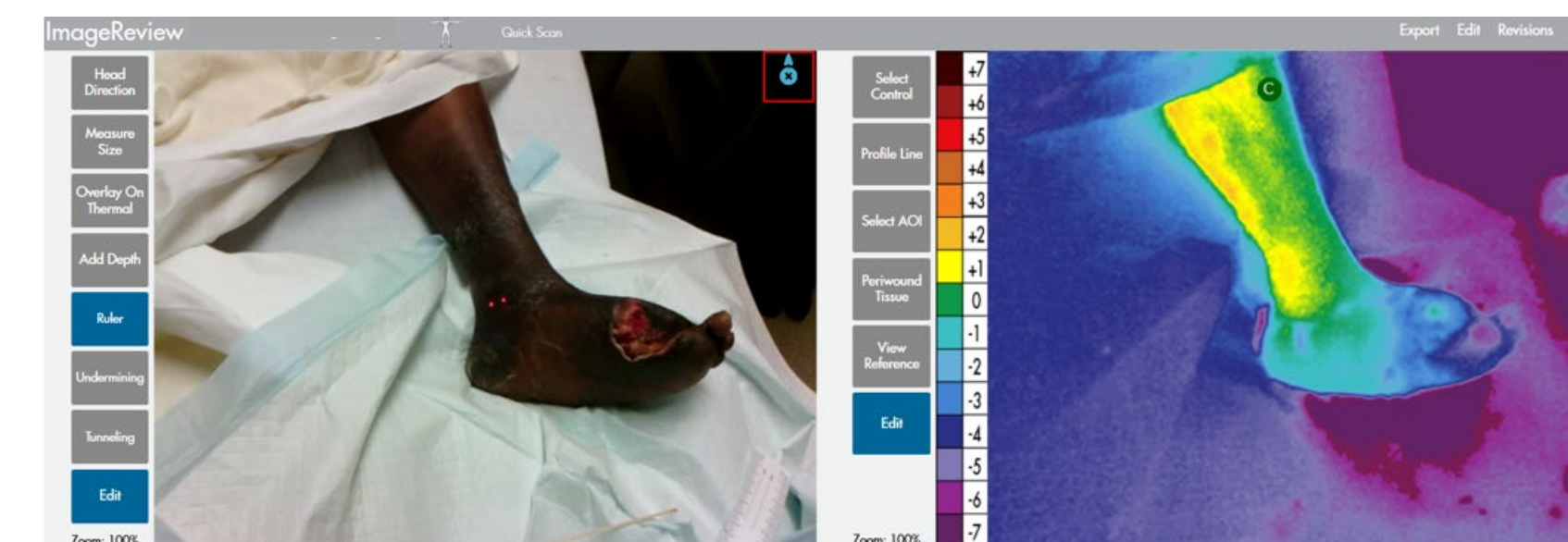
Case # 3 Gas Gangrene

57-year-old patient with Type 2 DM, nonhealing foot wound complicated by infection. LWIT showed increased thermal energy/pattern resulting in additional diagnostic tests which revealed gas gangrene.



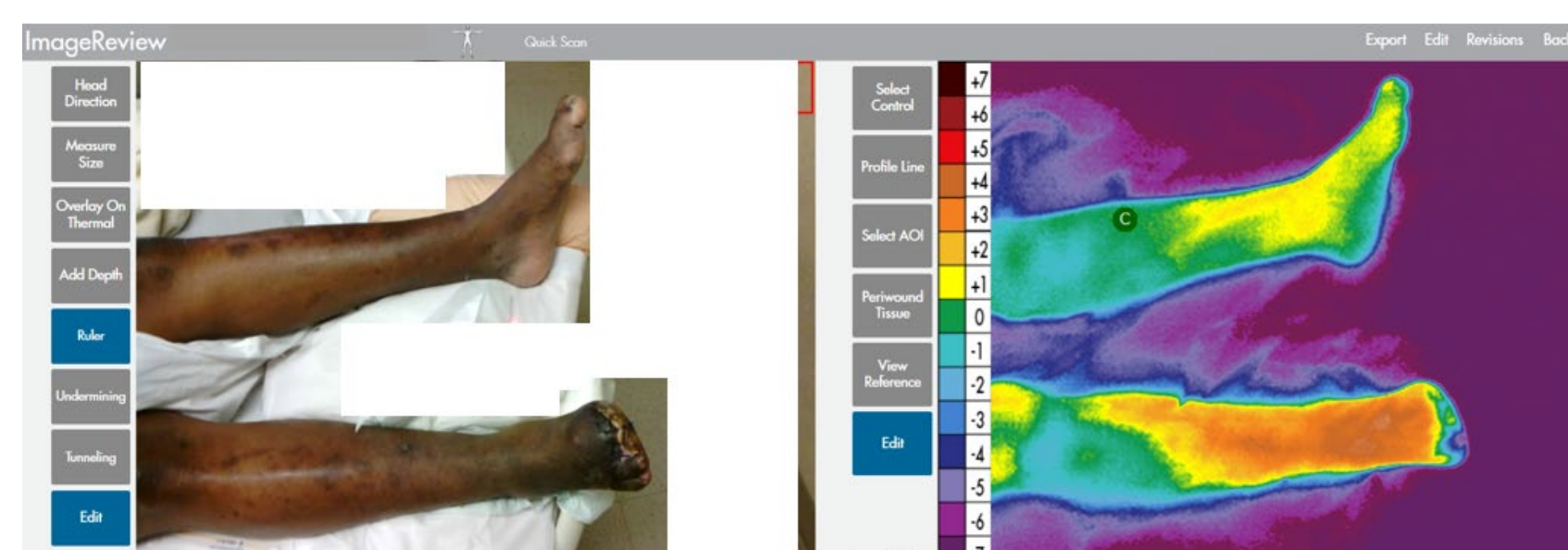
Case # 4 Arterial Insufficiency

86-year-old patient with a foot ulcer and abscess, history of Type 2 DM, Peripheral Arterial Disease (PAD), prior 1st toe amputation, non-revascularization. LWIT showed decreased thermal energy/pattern which led to arterial testing which confirmed ischemia.



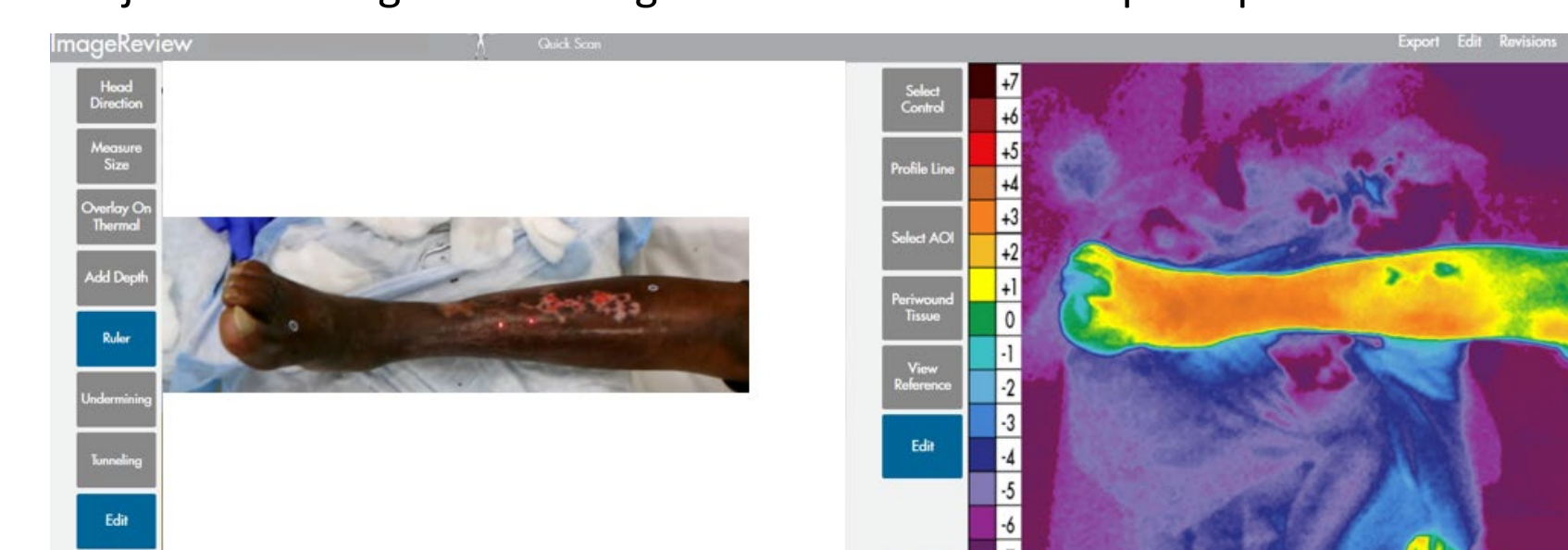
Case # 5 Infection Post-Amputation

51-year-old patient with history of Type 2 DM, arterial calcification, recent transmetatarsal amputation, right lower extremity (RLE) arterial revascularization. LWIT demonstrated an increased thermal energy/pattern resulting in hospitalization secondary to an infection validated by clinical assessment/ labs. Patient on antibiotics secondary to positive wound culture.



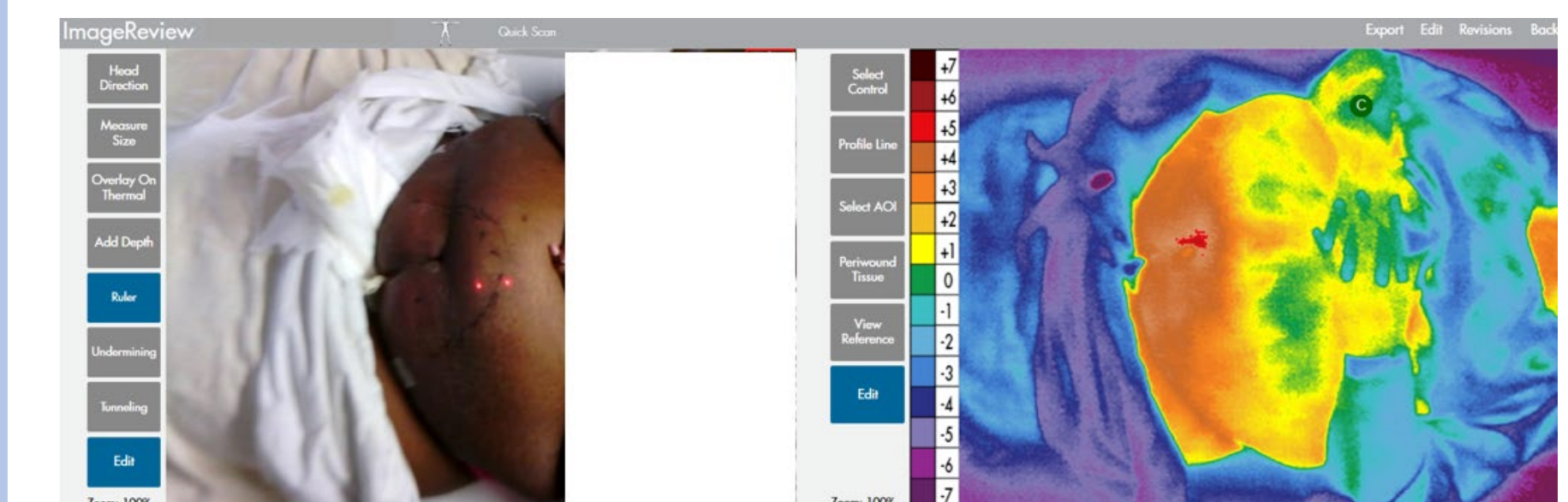
Case # 6 Pyoderma Gangrenosum (PG)

78-year-old patient with non-healing leg wound, history of type 2 DM, end stage renal disease (ESRD), and PAD referred for revascularization. LWIT showed increased thermal energy/pattern in combination with clinical and objective testing led to a diagnosis of PG with subsequent prednisone therapy.

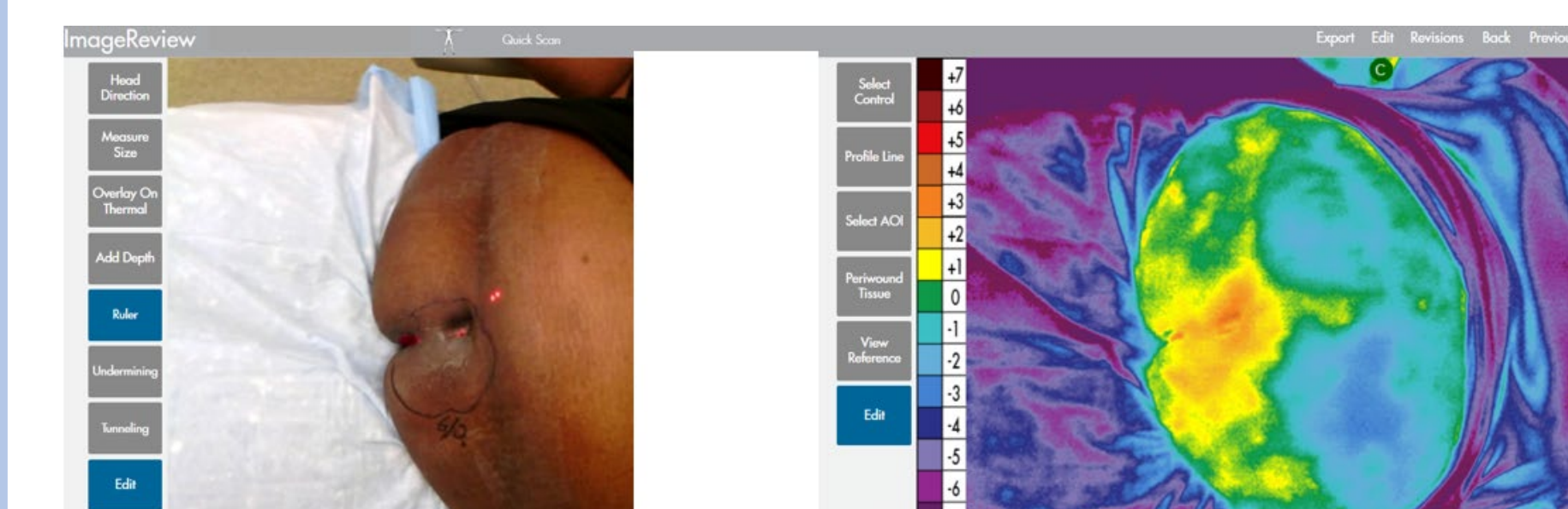


Case # 7 Infection and Dehiscence Incision

45-year-old patient with a dehiscence abdominal wound that became infected. Readmitted to hospital for Incision & Drainage (I & D) and antibiotics. LWIT demonstrated increased thermal energy/pattern. Extensive induration palpated.



Patient reimaged 6 days later noting a decrease in thermal pattern. Induration decreased noted by palpation



Patient imaged one-week post-prednisone treatment showed a decrease in thermal energy/pattern.

