

## Advancing Tissue Assessment when treating diabetic ulcers

### CASE STUDY

### Hyperbaric Oxygen Therapy (HBOT) and debridement in patient with non-healing diabetic ulcer of the posterior leg/ankle

Supporting and confirming visual evaluation and real-time decision making.

### CASE HISTORY

78-year old male with a history of Type 2 diabetes, PAD, and ESRD on hemodialysis. The ulcer originated from a combination of effects of diabetes, ischemia, and calciphylaxis. The patient underwent revascularization of his superficial femoral artery, anterior tibial artery and posterior tibial artery. Much of the treatment in the following months was aimed at his calciphylaxis. It became apparent that the necrotic and most distal area of the Achilles tendon was going to be the major remaining hurdle, showing evidence of acute calcaneal osteomyelitis. HBOT was initiated to treat the non-healing ulcer.

Tissue oxygenation images were captured with Snapshot<sub>NIR</sub> at three times during the patient visit on Day 1:

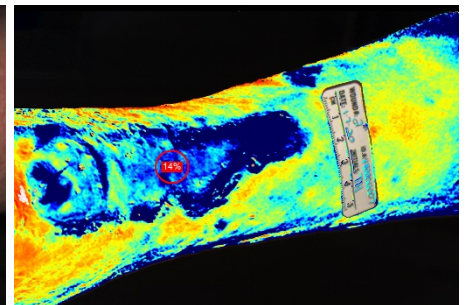
1. Start of the visit with evaluation, before intervention;
2. Immediately following HBOT; and
3. Following debridement (initiated after the HBOT)

The patient returned on Day 2 for his next HBOT treatment. The pre-HBOT image illustrated decreased tissue oxygenation from the HBOT+Debridement image from Day 1.

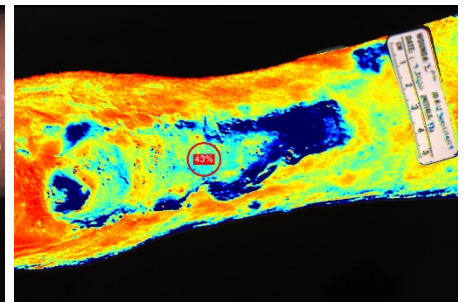
### OBSERVATIONS

The images captured with Snapshot<sub>NIR</sub> emphasized the importance of both HBOT and debridement for this patient. The darkest blue proximal tissue was a combination of crusted exudate and hyperkeratotic skin, by-and-large. The central tissue [medium blue before HBO (14%) and faint green after HBO (43%)] was largely a layer of biofilm. The most distal dark blue tissue was a focus of necrotic Achilles tendon, which was not completely debrided on Day 1 due to patient pain. The need for debridement was clinically obvious.

A. Day 1: Pre-HBOT



B. Day 1: Post-HBOT



### Portable for all points of care

#### Rapid Assessment

Quickly and easily assess the wound bed and surrounding tissue without the use of dyes or patient contact.

#### Wound Debridement

Clearly identify non-viable tissue in and around the wound bed. Repeat imaging as needed to confirm graft survival.

#### Wound Monitoring

Ability to assess dehisced, chronic or slow healing wounds in conjunction with hyperbaric pressure or other treatments without the need for injections or patient contact.

#### Documentation and Tracking

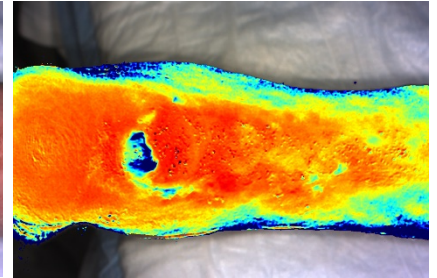
Track and compare the same patient throughout their care. Assess patients where you see them to record treatment progress and evaluate effect of the treatment modality.

#### Patient Compliance

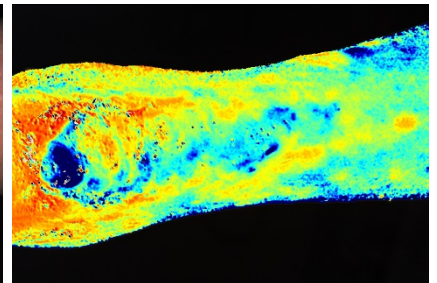
Share images with patients to provide visualization of treatment progress. Encourage patients through treatment and therapy.



C. Day 1: Post HBOT & Debridement



D. Day 2: Pre-HBOT



**Figures C and D:** Note the large decrease in tissue oxygenation at the wound site on Day 2 (D) in the pre-HBOT NIRS image, compared to the oxygenation achieved with HBOT and Debridement on Day 1 (C). This day over day decrease suggests wound ischemia.

### IMAGES AND ACTION

The change in  $S_tO_2$  image appearance from the final image on Day 1 to the pre-HBOT image on Day 2 suggests wound ischemia. Clinical evaluation had been questionable as most of the wound was granular, with a couple of small fibrotic foci and only the very distal Achilles tendon tissue was extensively necrotic. Arterial Duplex a week later was equivocal, due to vascular calcifications.

Supported by the results of repetitive imaging with Snapshot<sub>NIR</sub>, the patient was moved quickly to OR debridement of tendon and bone, retrieving some bone for culture in order to treat the patient's calcaneal osteomyelitis. The use of TCOM was not utilized due to concern that the patient's edema and hyperkeratosis would have led to falsely low  $tcpO_2$  levels.

Should wound healing be sluggish following this intervention and repeat images captured with Snapshot<sub>NIR</sub> continue to show a strong difference in appearance between pre- and post-HBOT time periods, an angiogram may be repeated.