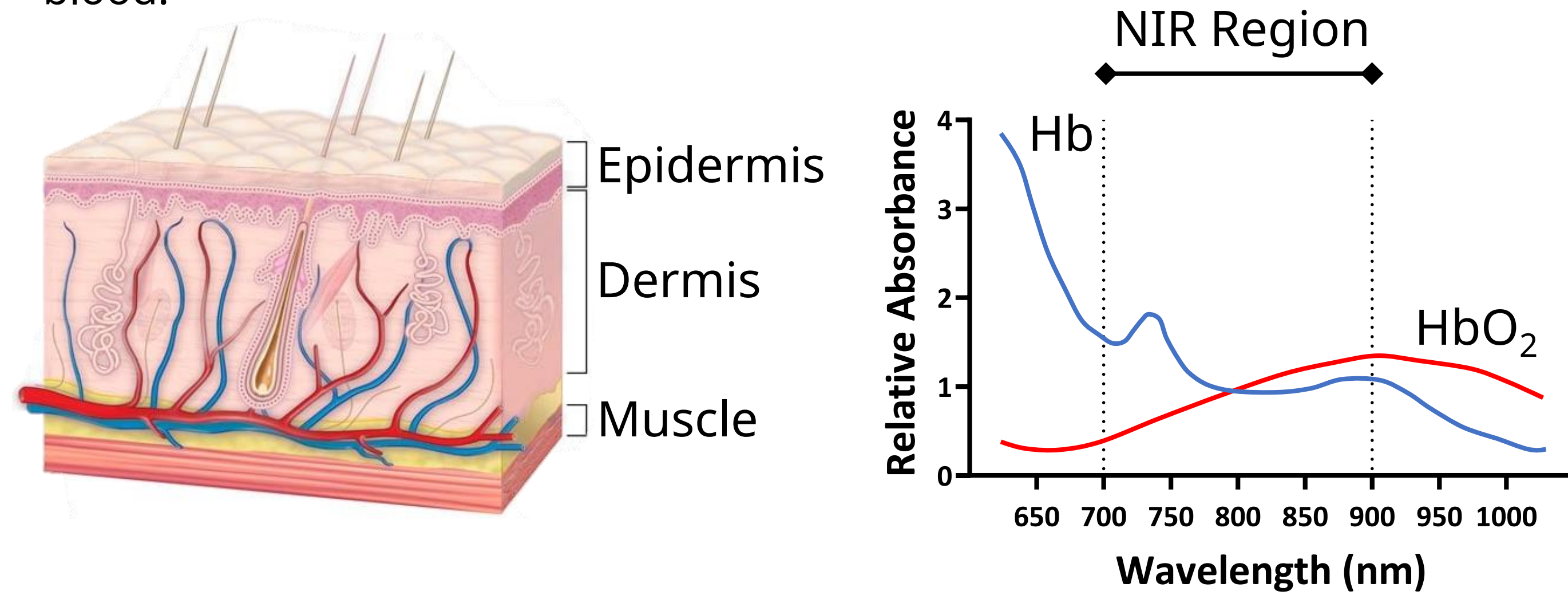


Background

Near-infrared spectroscopy (NIRS) has been used both to evaluate tissue oxygen saturation (S_tO_2) and as a putative method for assessing perfusion in superficial tissue.

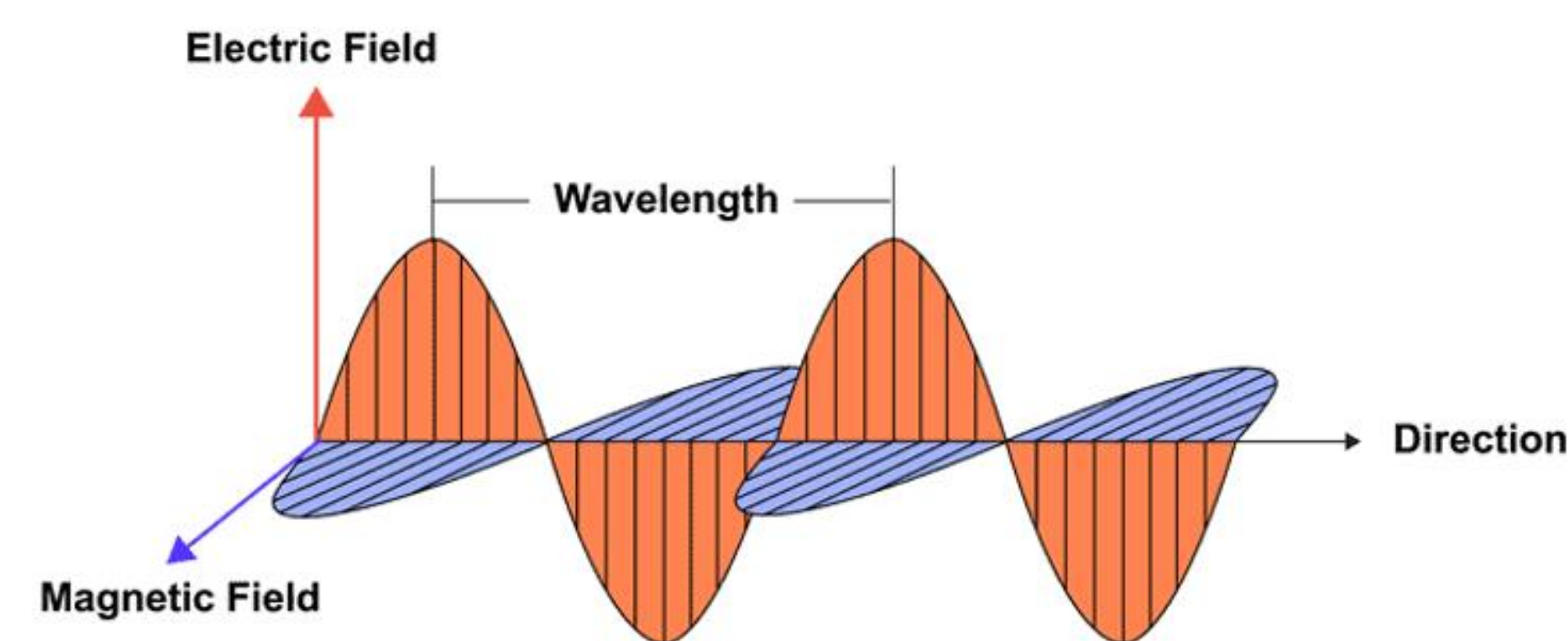
Near-infrared light penetrates ~2-3 mm into the skin and is differentially absorbed by oxygenated (HbO_2) and deoxygenated hemoglobin (Hb) in blood.



Adapted from Cleveland Clinic, 2006

Adapted from ¹Sordillo et al., 2014

Pulsed electromagnetic field (PEMF) therapy is a non-invasive therapy approved to treat pain²⁻⁴, inflammation, and edema. PEMF therapy is hypothesized to induce vasodilation and enhance tissue perfusion.



Technology

RegenesiS Therapy (RegenesiS, Scottsdale, AZ) delivers a proprietary pulsed electromagnetic energy field at a frequency of 27.12 MHz.



An example PEMF device



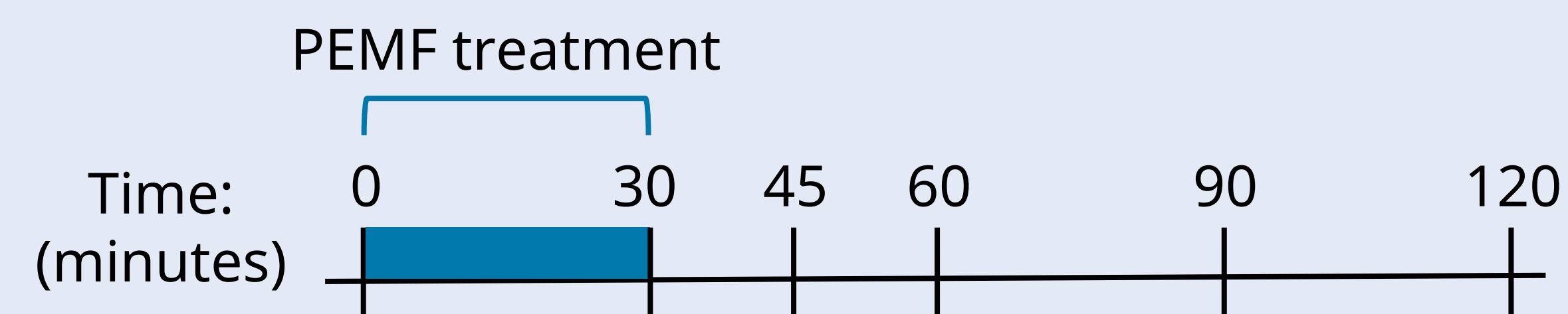
SnapshotNIR camera



SnapshotNIR measures relative amounts of HbO_2 and deoxygenated Hb in the microcirculation. A tissue oxygenation map is generated which can be used to track $S_tO_2\%$ over time.

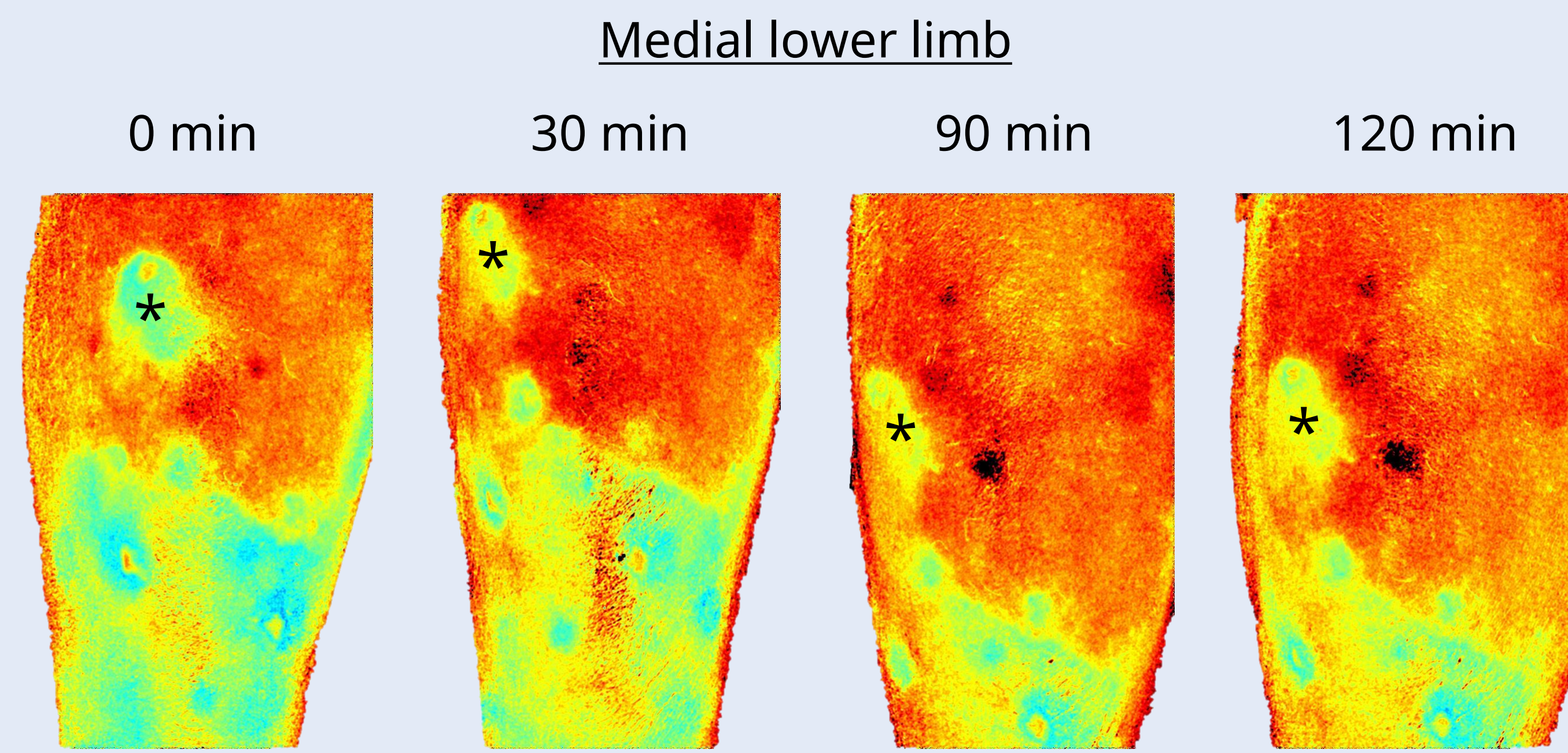
Experimental Design

Patients underwent 30 minutes of PEMF therapy to one lower extremity. Limbs were imaged with the SnapshotNIR camera (Kent Imaging; Calgary, Canada) to measure S_tO_2 before and immediately after PEMF treatment, then at defined timepoints.

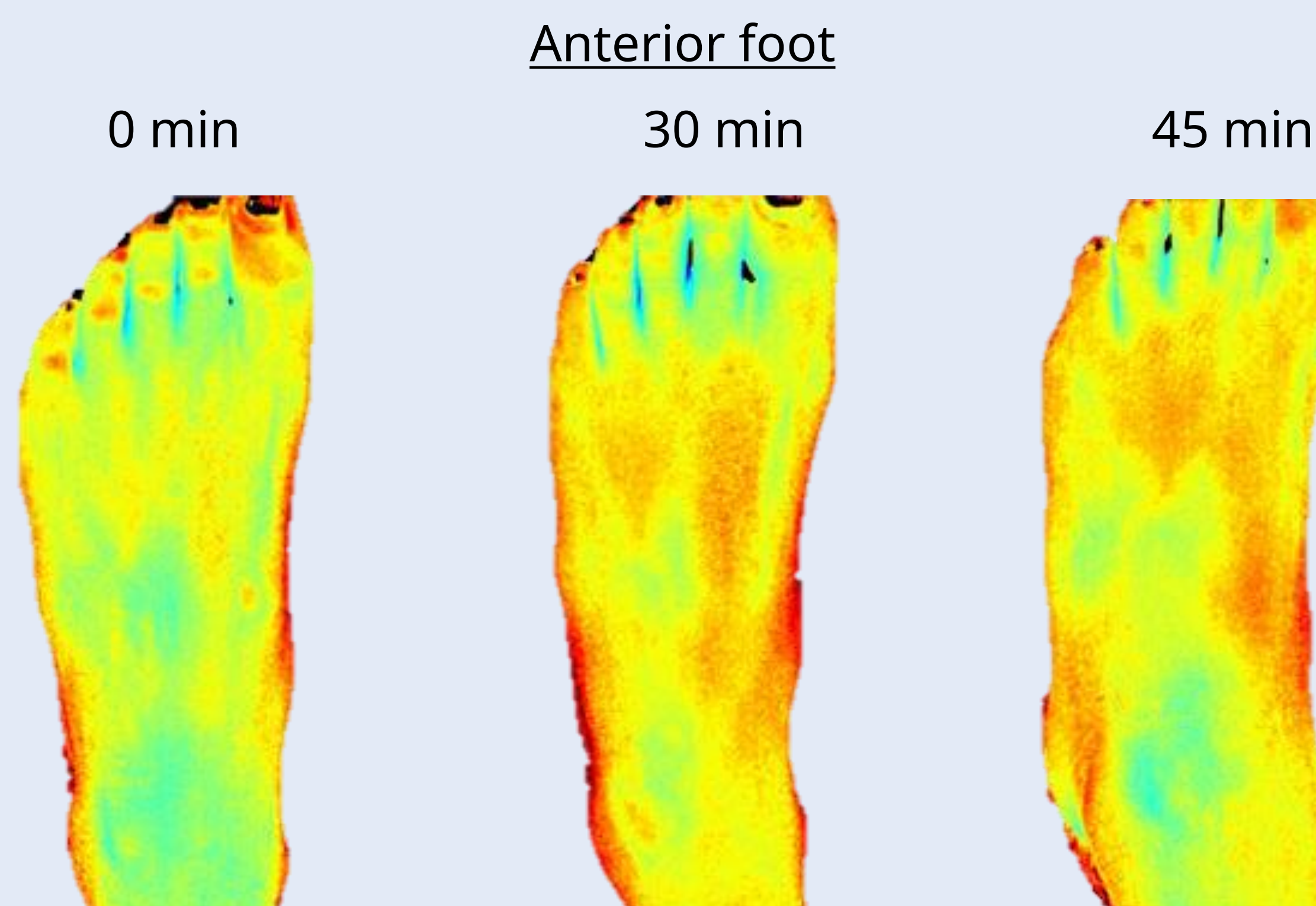


Diseased Patients

Case 1: 36-year-old male with history of venous insufficiency and lower extremity leg ulcers. Images show a significant increase in S_tO_2 following a single 30 min PEMF treatment. The improvement in S_tO_2 persists for 120 min post therapy. * ulcer as landmark for comparison.

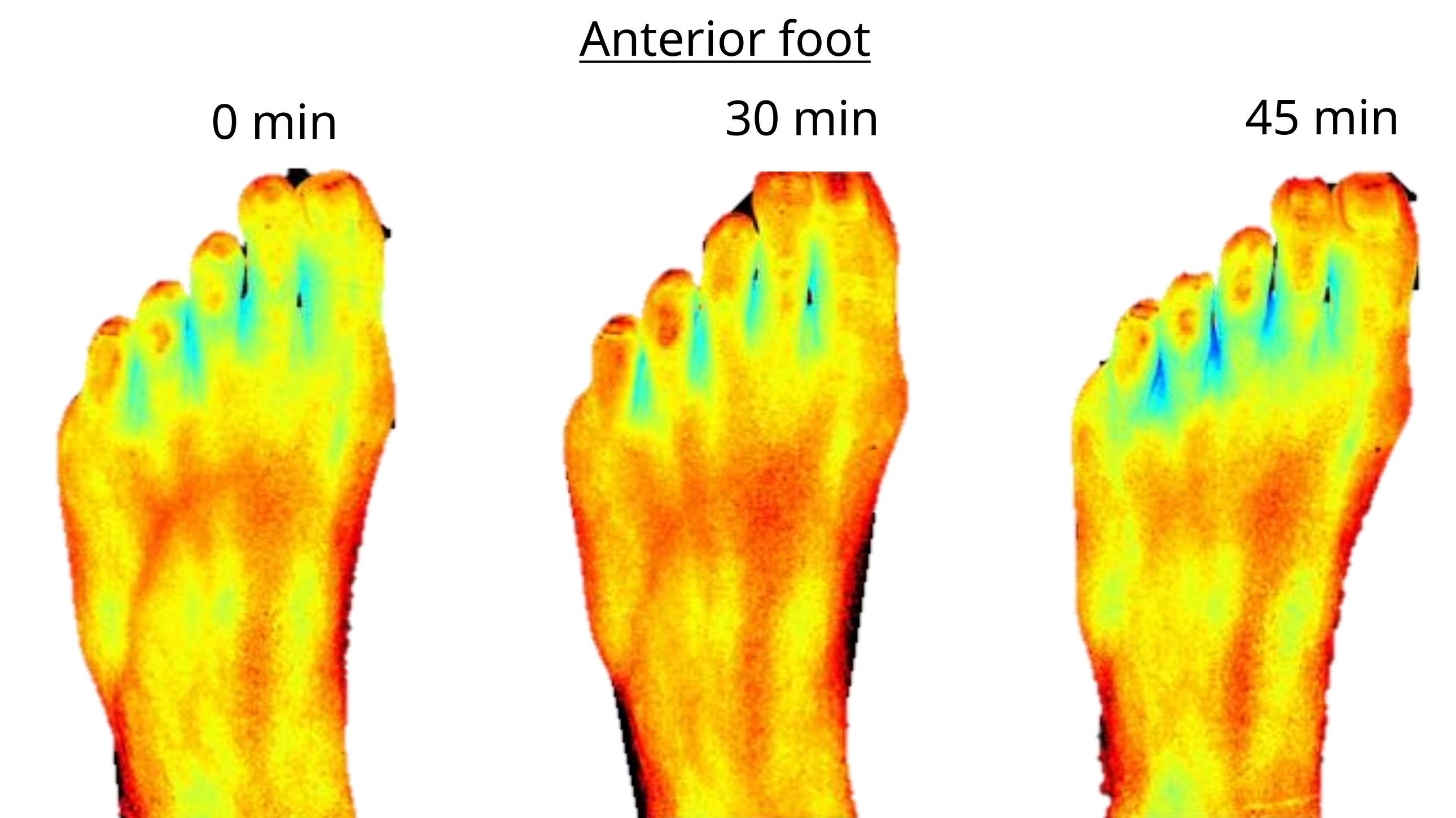


Case 2: 60-year-old female with history of Reynaud's Disease received a single 30 min PEMF treatment. Images show a significant increase in S_tO_2 that persists for 45 min post therapy.



Healthy Patient

Case 3: Healthy 21-year-old female shows slight augmentation in S_tO_2 following a 30 min PEMF treatment. The S_tO_2 increase subsides within 15 min of the end of treatment.



Conclusions

- NIRS is a novel imaging technique that allows for immediate, non-invasive assessment of tissue oxygenation and perfusion.
- Immediately following PEMF therapy, S_tO_2 and perfusion were enhanced in the lower extremities of healthy and diseased patients.
- Sustained increases in S_tO_2 were observed for up to 120 min after PEMF treatment in a patient with preexisting vascular deficits.
- S_tO_2 returned to baseline values within 15 minutes of PEMF treatment in a healthy patient.
- PEMF therapy is a promising therapeutic strategy for increasing perfusion.
- There is potential to explore the use of PEMF therapy for treatment of diabetic peripheral neuropathy and chronic wounds.

Acknowledgements

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