

Tissue Oxygenation Changes in a Large Diabetic Foot Ulcer: Longitudinal Case

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Diabetic Foot Ulcers (DFUs) are responsible for 20% of diabetic-related hospitalization and for 85% of diabetes related amputations. A near-infrared optical scanner (NIROS) was developed to image for tissue oxygenation of DFUs and assessing the healing status of the wounds. The device was capable to imaging smaller DFUs but was limited to image large wounds. A non-contact hand-held NIROS was developed to image large tissue surfaces. NIROS was used to collect diffused reflected images at 10Hz frequency and the light source is composed of several multi-wavelengths LEDs covering a range of 600-900nm and with a 10Hz frequency. This allowed collection of diffused reflectance images, which were in turn used to obtain hemodynamic maps in terms of oxy- (DHbO), deoxy- (DHbR), total hemoglobin (DHbT), and saturated oxygen (DStO₂). A week by week basis study (~ 20 weeks) was performed on a mixed DFU/arterial wound subject. The images were later processed using modified Beer-Lambert's Law (mBLL) to obtain tissue oxygenation parameters of the entire imaged tissue. Changes (from weekly studies of the same wound) in saturated oxygen DStO₂ across different regions of the wound are shown in Figure 1 as a sample case. Evaluating mixed DFU/arterial wound subject using NIROS is potentially useful as a means for noncontact monitoring of large wound healing process and to measure subsurface changes in StO₂ of different regions.