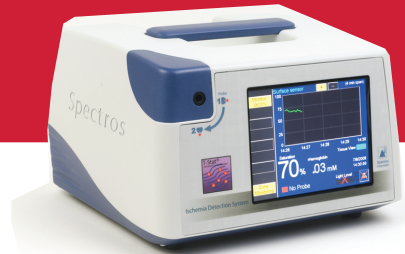


Change In Skin Saturation Over Time with Arterial Occlusion Measured with T-Stat

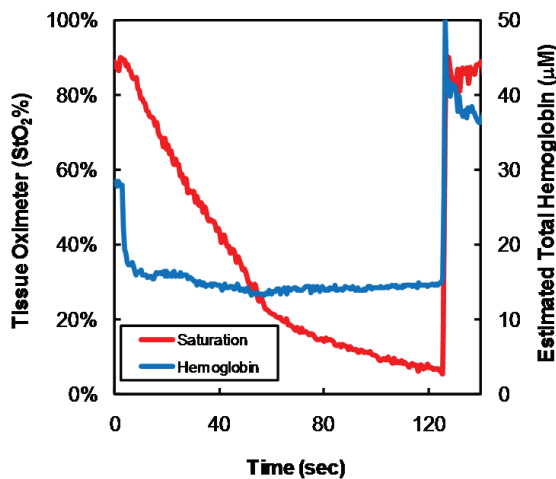


PLASTIC SURGERY

Background: NIRS methods to measure skin saturation have failed, in large part due to the use of few wavelengths and deeply penetrating rays that cannot detect the saturation of thin skin flaps. In contrast, the T-Stat VLS Tissue Oximeter uses hundreds of wavelengths, and shallow penetrating visible light, producing stable measurements even in thin tissues such as skin, the intestinal mucosa.

Methods: A T-Stat VLS probe was placed on the skin on the face of human subjects under IRB approval. Pressure above arterial blood pressure was applied to the skin blood source, resulting in an immediate drop in arterial flow without obstruction of venous return. Pressure was maintained for 120 seconds, followed by release of pressure. Each of these studies was repeated on multiple subjects and for multiple replications.

Results: Skin StO₂% fell during regional skin ischemia (Figure). The initial rate of StO₂% fall was $-1.3 \pm 0.2\%$ per second. Total hemoglobin fell from 0.028 mM to as low as 0.014 mM, an over 50% drop. After reversal of ischemia, StO₂% and saturation difference returned to baseline in all tissues within seconds, while total hemoglobin increased for 2-3 minutes before returning to baseline. The mean pulse/VLS difference, the difference between pulse oximetry and VLS oximeter readings, rose significantly during ischemia (11-27% baseline vs. 91% peak ischemia, $p < 0.001$).



Discussion: Both skin arterial occlusion, and reversal of the blockage, were detectable within seconds. In comparison to VLS measures during cardiac arrest published previously, the initial rate of StO₂% drop in the skin was identical to the previously published rate of $-1.2 \pm 0.1\%$ per second ($p = \text{N.S.}$) that was measured during cardiac arrest. Measures of venous occlusion have shown increased or stable total hemoglobin, in contrast to the nearly 50% drop in hemoglobin content seen during the arterial occlusion of this study.

Conclusion: T-Stat VLS values are sensitive within seconds to arterial occlusion, and to restoration of normal flow. A fall in total hemoglobin suggests an arterial obstruction, while ischemia in the presence of a stable or rising total hemoglobin suggests venous occlusion.