Evaluation of Tissue Oxygenation

using Near Infra-red Spectroscopy Following Noncontact, Low-Frequency Ultrasound (LFU) Therapy

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Introduction

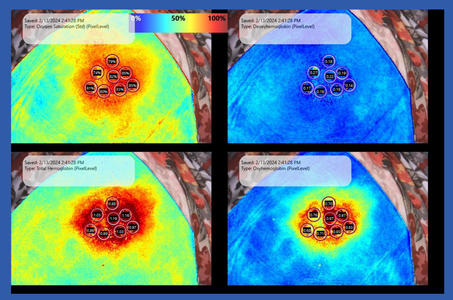
Near infra-red spectroscopy (NIRS) has been used to evaluate tissue oxygen saturation and perfusion through the incorporation of Noncontact, Low-Frequency Ultrasound (LFU) Therapy technology. LFU therapy produces a low energy ultrasound-generated mist to promote wound healing through wound cleansing and maintenance debridement by the removal of fibrin, yellow slough, tissue exudates, and bacteria. This case series presentation demonstrates the effect of LFU therapy on enhancement of tissue oxygenation and perfusion using NIRS.

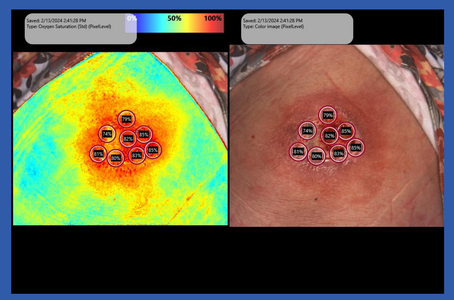
Methods

NIRS (SnapshotNIR), is a non-invasive imaging device that can measure oxygenated and deoxygenated levels of hemoglobin in the wound and periwound tissues to calculate and create an image of tissue oxygen saturation. Noncontact, Low-Frequency Ultrasound (LFU) Therapy System is an easy-to-use, portable, painless, noncontact, noninvasive, advanced wound care technology that delivers low-frequency ultrasound to the wound. LFU therapy goals are to jump-start the cellular healing process, eliminating barriers to healing by decreasing inflammation, bacteria, and biofilms, while increasing perfusion and vasodilation. This treatment results in a significantly shorter time to wound closure, prevention of reoccurrence, and a substantial reduction in pain. A series of cases is presented to demonstrate the effectiveness of LFU therapy in increasing tissue perfusion oxygenation using SnapshotNIR.

Results

Three subjects received LFU therapy for their wounds/ulcers. LFU therapy was administered using the manufacturer's recommended use guidelines. Each subject was treated per the guidelines, then SnapshotNIR imaging was accomplished before and after therapy. LFU acoustic wave therapy promotes healing by controlling inflammation and reducing bacteria in the wound bed while increasing angiogenesis. Further, to promote healing, it increases perfusion through vasodilation, ultimately increasing oxygen and nutrients to the tissue. Increases in tissue oxygenation were measured in the treated wounds/ulcers using NIRS in both subjects.

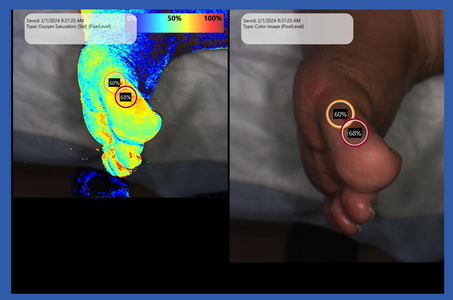




Pt #1 - 87 y/o female, bed bound and unable to turn herself, ongoing deterioration – Pressure Injury Unstageable x3 onset 1/29/24 – 1st visit 2/13/24 Buttock (unstageable) heel (stage III), back (stage III) (10.44 sq cm). Obtained NIRS images, StO2 >80%, noted total hemoglobin >1 indicating inflammation. Painful with debridement, plans to initiate LFU therapy.

Discussion

Advanced Adjunctive LFU Therapy specifically targets inflammatory cells, bacteria, biofilms and increase perfusion through vasodilation, to promote healing through angiogenesis and tissue regeneration with limited side effects. This study is the first of many to demonstrate enhancement of tissue oxygenation and perfusion using NIRS imaging following LFU therapy. Additional research is suggested to further define the clinical ramifications of this finding.



Pt #2 - 68 y/o female with multiple comorbidities diabetes, renal disease onset September 2023. 10 wounds mixed etiologies (pressure, venous, diabetes (post TMA). Obtained NIRS images, StO2 <50%, concerns with microcirculation. Plans to refer out for other testing. Patient is at high risk of another amputation. Painful with debridement, plans to initiate LFU therapy.

References

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