

Advancing Wound Healing Assessment:

The Potential of LFU Therapy Evaluated Through Mobile Multispectral Near-Infrared Spectroscopy



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Introduction

Chronic wounds, affecting over 6 million Americans, pose significant challenges and an increased risk of amputations!. Recognizing the societal burden associated with non-healing wounds and their substantial impact on the quality of life for affected individuals¹, there is a pressing need for advanced modalities in wound management. While conventional protocols succeed in some cases, they often fall short for patients with chronic, non-healing wounds. This study aims to investigate the efficacy of non-contact, non-thermal, low-frequency ultrasound (LFU) therapy by employing mobile multispectral near-infrared spectroscopy (NIRS). The objective is to elucidate the specific pathways through which LFU impacts the healing process, with a focus on documenting and quantifying the wound healing trajectory.

Methods

Using an FDA-cleared handheld mobile multispectral near-infrared imaging device with thermal capabilities^{*}, temperature and tissue oximetry (StO₂) were measured pre- and post-treatment using the FDA-cleared LFU device^{**}. The analysis focused on documenting and quantifying the wound healing process.

Results

NIRS imaging revealed disparities in tissue oximetry and temperature following LFU treatment. While LFU therapy promoted healing through vasodilation and the acceleration of angiogenesis, NIRS imaging facilitated the quantification of healing by measuring StO₂ levels and visualizing angiogenesis processes.

Discussion

The utilization of NIRS imaging has the potential to play a crucial role, not just in documenting the effectiveness of LFU treatments, but also in quantifying the healing trajectory across a diverse spectrum of chronic and acute wounds in various patient settings. NIRS has the capability to contribute to the comprehension of LFU treatment's clinical effectiveness visually demonstrating expedited angiogenesis at the wound site. Recognizing this potential, NIRS could become an indispensable tool for nurse practitioners, enriching their understanding of the healing trajectory. Looking ahead, as our understanding of the mechanisms underlying the efficacy of LFU treatments continues to advance, it is likely to lead to the optimization of parameters and the discovery of novel applications for this technology.

References

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^{*} MIMOSA Pro, MIMOSA Diagnostics Inc., Toronto, ON.
^{**} UltraMST, SANUWAVE and SANUWAVE Health, Inc., Eden Prairie, MN

Patient #1 - 79 year old female with ongoing LLE due chronic Vascular (mixed etiologies including lymphedema) Standard Care Initiated, lymphedema pumps, vascular consultant and interventions. NIRS to identify the StO₂ at the tissue wound bed / angiosome and LFUS therapy was initiated due to increasing pain during surgical debride.

Patient #2 - 88 year old female, LLE Venous / Lymphedema with underlying arterial disease onset over a year ago. She has reoccurring infection being managed by her Infectious Disease Physician. LFUS treatments initiated, before and after NIRS showing improvements of StO₂ before and after.



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