

Exploring the Therapeutic Potential of Three-Dimensional Decellularized Porcine Liver Grafts

Through Mobile Multispectral Near-Infrared Spectroscopy: A Case Series



Authors: Ali Saberi, MD | Christina Asher, APRN | Amber Gephart, APRN, FNP-C | Patrick Reici, APRN | Yisel Ruiz, APRN | Lori Back, APRN | Evan Brewer, APRN | Audrey K Moyer-Harris, BSN, RN, MBA, CWS

Introduction

Chronic wounds affect millions of patients worldwide, placing a significant burden on healthcare resources! Addressing the complexities associated with wounds extending to various underlying tissues, including deep, tunneling, and irregular wounds, poses unique challenges. This study aims to explore the therapeutic potential of three-dimensional (3D) grafts as a viable solution for such wounds. This case series explores the potential of skin substitutes using mobile multispectral near-infrared spectroscopy (NIRS), with a focus on the 3D grafts for deep and tunneling wounds.

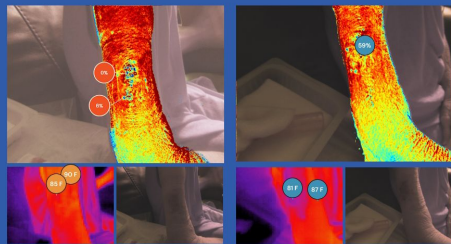
Methods

An FDA-cleared handheld mobile multispectral near-infrared imaging device with thermal capabilities* was utilized for measuring temperature and tissue oximetry (StO₂) in a non-wound contact manner. The device used in this study also captured digital photographs. This case series assesses the effectiveness of an FDA-cleared skin substitute product** on the healing rate of deep, tunneling, and irregular wounds. Patients were longitudinally tracked to observe the healing trajectory, and relevant data, including demographics, clinical characteristics, and NIRS findings, were collected and analyzed.



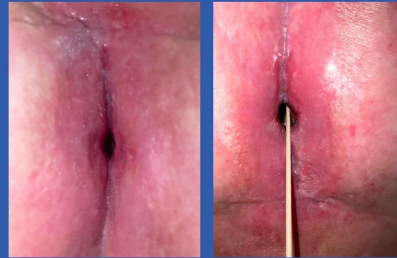
PRIOR THE FIRST APPLICATION

Pre-Debridement Post-Debridement

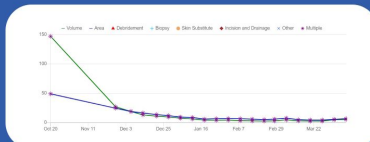
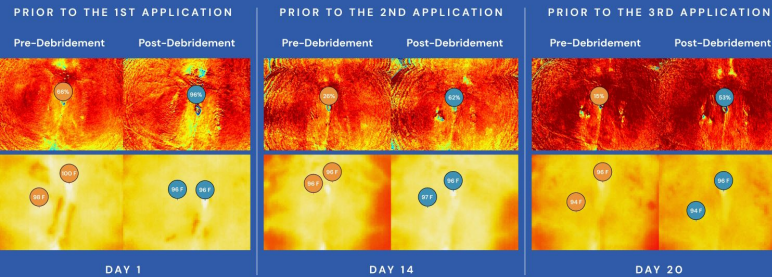


DAY 1

Pt #1 – 78 y/o female was in a MVA on date 9/1/23 which required nerve repair and a non healing laceration on her arm. Her 1st visit by our provider 1/16/24 10 sq cm using standard of care, monitoring for bacteria loads, moist wound healing. Wound started to show signs of healing however over the next couple of weeks the wound started to deteriorate and now is 12 sq cm. Plans are to start grafting.



Pt #2 – 51 y/o female, Sacral post surgical 5cm tumor removed that was attached to her sacrum (partial sacrectomy and total coccygectomy with sphincteroplasty with radiation. 1st visit with our providers 11/29/23 very complex, measures 1.2x0.5x3.2 with tunneling at 7 o'clock position to 4 cm depth. Periwound area is erythematous and edematous. Edema fluctuates due to nature of radiation history, patient ability to tolerate massage and manipulation of area and compression.



Pt #3 – 58 y/o male pressure injury stage 4 4.49 sq cm with 3cm depth and undermining. Initiated 3D graft 6 applications it is healing and currently measuring 0.56 sq cm with 0.5cm depth.

Results

NIRS imaging provided a comprehensive visualization and documentation of the healing trajectory, capturing variations in tissue oximetry and temperature post-skin substitute application. It proved to be an efficient method, not only indicating the current state of the wound but also assisting in determining whether the wound is progressing toward normal healing. Perfusion parameters were correlated with wound depth. Additionally, thermal imaging provided valuable insights, as inflammatory reactions can induce temperature elevation at the wound site.

Discussion

The success of 3D grafts in deep and irregular wounds, monitored by NIRS, has significant clinical implications. The comprehensive visualization provided by NIRS in monitoring healing trajectories offers invaluable insights for healthcare professionals. Beyond indicating the current state of the wound, NIRS assists in determining whether the wound is progressing toward normal healing. Perfusion parameters correlating with wound depth provide a nuanced understanding of the healing process. However, acknowledging study limitations, future research should explore long-term outcomes, compare graft types, and optimize application timing for deeper insights into 3D graft effectiveness in chronic wound care.

References

- Li S, Mohamedi, A. H., Senkowsky, J, Nair, A. & Tang, L. Imaging in Chronic Wound Diagnostics. Adv. Wound Care 9, 245–263 (2020).
- Mimosa Pro, Mimosa Diagnostics Inc., Toronto, Canada
- ** Miro3D wound matrix, Reprise Biomedical, Inc., Plymouth, MN



Scan to learn more about HealPrecisely™

5880 49th Street North, Suite N-201 St. Petersburg, FL 33709



www.healprecisely.com