



MIMOSA



ANNOTATED BIBLIOGRAPHY

TECHNOLOGY DESCRIPTION



EASE OF USE

Portable and lightweight technology fits easily into your workflow. Both doctors and nurses can use it!



SAFE / NO - TOUCH

Non-invasive and COVID safe with no injectable dyes resulting in zero patient contact.



ACCURATE

Precise visualization of oxygen saturation for faster assessments and healing trajectory predictions.



ANY SKIN TONE

40% Global Population is NOT Caucasian. Built in control for skin melanin content. Overcomes systemic racial bias in healthcare.



INSIGHT

Tissue health is determined by expert clinicians based on vascularity and oxygenation. Delays or lack of understanding of tissue health can lead to wounds, amputation, or even death.



RISK PROFILE

A means to track and document patient progress to improve clinical outcomes and mitigate risks early.



ANY HEALTH SETTING

Portability and miniaturization permits utility in any healthcare setting directly by the patients side.



POINT OF CARE

A portable technology, driving efficiency and accuracy in the diagnostic capabilities of clinicians. The magic of this technology is that its skin pigment, clinical specialty, and care setting agnostic - hence providing equitable access.



MIMOSA is a handheld device that uses near-infrared light to accurately and non-invasively assess tissue health. It can be easily used by a patient or a caregiver, and the images produced will help inform the next steps within patient navigation and management (e.g. you need to see a podiatrist, or a vascular surgeon to help with the blood flow, or you may need more urgent treatment to prevent severe complications like limb loss).

With more accurate monitoring and early diagnosis, patients are getting better treatment, and as a result the amputation rates can be reduced dramatically. Not only can this approach save limbs, but rather lives. This emerging assessment and diagnostic tool will have huge impact in the management of patients with compromised vasculature. MIMOSA is going to change the way in which many of these patients are managed.

LEVASSEUR M, LEONARDI L, FISH JS, CROSS KM ET AL. NEAR INFRARED HYPERSPECTRAL IMAGING: THE ROAD TRAVELED TO A CLINICAL BURN APPLICATION. PROC. SPIE. 2005;5969 [[LINK](#)]

This study explores the possibility of using near-infrared spectroscopy to provide an objective and accurate means of distinguishing shallow injuries from deeper burns that require surgery. Using an acute porcine model of thermal burn injuries, the potential of near-infrared spectroscopy to distinguish between shallow healing burns and deeper burn injuries was demonstrated.

CROSS KM, SOWA MG, LEONARDI L, FISH JS ET AL. NEAR INFRARED POINT AND IMAGING SPECTROSCOPY FOR BURN DEPTH ASSESSMENT. COMPUTER ASSISTED RADIOLOGY & SURGERY: ICS. 2005;1281C:137-142 [[LINK](#)]

Near Infrared Spectroscopy (NIRS) can accurately predict burn wound depth in human subjects. This study supports the use of NIRS as a method to objectively determine burn depth.

SOWA M, LEONARDI L, CROSS KM, FISH J ET AL. CLASSIFICATION OF BURN INJURIES USING NEAR-INFRARED SPECTROSCOPY. JOURNAL OF BIOMEDICAL OPTICS. 2006;11(5):1-6 [[LINK](#)]

This study explores the possibility of using near-infrared spectroscopy to provide an objective and accurate means of distinguishing shallow injuries from deeper burns that require surgery. Using an acute porcine model of thermal burn injuries, the potential of near-infrared spectroscopy to distinguish between shallow healing burns and deeper burn injuries was demonstrated.

CROSS KM, SOWA MG, LEONARDI L, FISH JS ET AL. CLINICAL UTILIZATION OF NEAR INFRARED SPECTROSCOPY FOR BURN DEPTH ASSESSMENT. WOUND REPAIR AND REGENERATION. 2007;15:332-340 [[LINK](#)]

The diagnosis of burn depth is based on a visual assessment and can be subjective. Near-infrared (NIR) spectroscopic devices were used preclinically with positive results. The purpose of this study was to test the devices in a clinical setting using easily identifiable burn wounds. These results confirm that NIR devices can successfully distinguish superficial and full-thickness burn injuries.



MULTISPECTRAL IMAGING

CROSS KM, LEONARDI L, FISH JS ET AL. NON-INVASIVE MEASUREMENT OF EDEMA IN PARTIAL THICKNESS BURN WOUNDS. J BURN CARE & RESEARCH. 2009;30:807-817 [LINK]

A lack of noninvasive tools to quantify edema has limited our understanding of burn wound edema pathophysiology in a clinical setting. Near-infrared spectroscopy (NIR) is a new noninvasive tool able to measure water concentration/edema in tissue. NIR holds promise as a noninvasive, portable clinical tool to quantify water content or edema in burn wounds.

CROSS, KM. 2010. ASSESSMENT OF TISSUE VIABILITY IN ACUTE THERMAL INJURIES USING NEAR INFRARED POINT SPECTROSCOPY. [LINK]

Near infrared (NIR) technology has shown promise as a non-invasive monitor of oxygenation and perfusion, and its potential to assess the depth of burn injuries has been investigated clinically over the past five years. The purpose of the thesis was to determine the capacity of NIR technology to differentiate acute thermal injuries. NIR spectroscopy could distinguish burn depth using water, oxy-, met- and total hemoglobin as separate entities. The presence of methemoglobin in the burn wounds is a novel finding that has not been described previously in burn literature.

LEUNG G, DUTA D, PERRY J, LEONARDI L, FISH JS, CROSS KM. RAPID TISSUE VIABILITY EVALUATION USING METHEMOGLOBIN AS A BIOMARKER IN BURNS. 2018. INT J BURNS TRAUMA. 2018 OCT20;8(5):126-134. [LINK]

The early surgical management of a severe burn is critical to patient outcome, but few tools exist for triaging viable and non-viable tissue at early time-points post-injury. Without a validated outcome measure, even experienced burn surgeons diagnose tissue viability with an accuracy of only 50-70%, with significant consequences for patient morbidity, mortality and cost to the healthcare system. In this work, we have developed a non-invasive device that uses near-infrared spectroscopy to rapidly assess traumatic burns at the bedside.

SAIKO, G, LOMBARDI, P, AU, Y, QUEEN, D, ARMSTRONG, D, HARDING, K. HYPERSPECTRAL IMAGING IN WOUND CARE: A SYSTEMATIC REVIEW. INT WOUND J. 2020; 17: 1840- 1856 [LINK]

Multispectral and hyperspectral imaging (HSI) are emerging imaging techniques with the potential to transform the way patients with wounds are cared for, but it is not clear whether current systems are capable of delivering realtime tissue characterisation and treatment guidance. As an emerging imaging modality for medical applications, HSI offers great potential for non-invasive disease diagnosis and guidance when treating patients with both acute and chronic wounds.



MULTISPECTRAL
IMAGING

CHIN, J, WANG, E, KIBBE, M, 2011. EVALUATION OF HYPERSPECTRAL TECHNOLOGY FOR ASSESSING THE PRESENCE AND SEVERITY OF PERIPHERAL ARTERY DISEASE. JOURNAL OF VASCULAR SURGERY, 54(6), PP.1679-1688 [[LINK](#)]

The aims of this study were to determine if hyperspectral imaging could accurately assess the presence or absence of peripheral artery disease (PAD) and accurately predict PAD severity. These results suggest the ability of hyperspectral imaging to detect the presence of PAD. Hyperspectral measurements can also evaluate different severities of PAD.

BOWEN RE, TREADWELL GRN AND GOODWIN MRRT. CORRELATION OF NEAR INFRARED SPECTROSCOPY MEASUREMENTS OF TISSUE OXYGEN SATURATION WITH TRANSCUTANEOUS PO2 IN PATIENTS WITH CHRONIC WOUNDS. SM VASC MED. 2016; 1(2): 1006 [[LINK](#)]

Assessment of tissue oxygenation and vascular function is an integral component in the management of chronic wounds. There was a significant correlation between measurements of tissue oxygenation using TCO2 and NIR spectroscopy. NIR spectroscopy has the advantage of not requiring skin contact and measurements can be taken even in the wound bed.

TISSUE OXIMETRY IN PERIPHERAL ARTERY DISEASE



ARMSTRONG DG, HOLTZ-NEIDERER K, WENDEL C, MOHLER MJ, KIMBRIEL HR, LAVERY LA. SKIN TEMPERATURE MONITORING REDUCES THE RISK FOR DIABETIC FOOT ULCERATION IN HIGH-RISK PATIENTS. AM J MED. 2007 DEC;120(12):1042-6. ERRATUM IN: AM J MED. 2008 DEC;121(12) [[LINK](#)].

To evaluate the effectiveness of home temperature monitoring to reduce the incidence of foot ulcers in high-risk patients with diabetes. High temperature gradients between feet may predict the onset of neuropathic ulceration and self-monitoring may reduce the risk of ulceration.

LAVERY LA, HIGGINS KR, LANCTOT DR, CONSTANTINIDES GP, ZAMORANO RG, ATHANASIOU KA, ARMSTRONG DG, AGRAWAL CM. PREVENTING DIABETIC FOOT ULCER RECURRENCE IN HIGH-RISK PATIENTS: USE OF TEMPERATURE MONITORING AS A SELF-ASSESSMENT TOOL. DIABETES CARE. 2007 JAN;30(1):14-20 [[LINK](#)]

The purpose of this study was to evaluate the effectiveness of a temperature monitoring instrument to reduce the incidence of foot ulcers in individuals with diabetes who have a high risk for lower extremity complications. Infrared temperature home monitoring, in serving as an "early warning sign," appears to be a simple and useful adjunct in the prevention of diabetic foot ulcerations.

KOERNER S, ADAMS D, HARPER SL, BLACK JM, LANGEMO DK. USE OF THERMAL IMAGING TO IDENTIFY DEEP-TISSUE PRESSURE INJURY ON ADMISSION REDUCES CLINICAL AND FINANCIAL BURDENS OF HOSPITAL-ACQUIRED PRESSURE INJURIES. ADV SKIN WOUND CARE. 2019 JUL;32(7):312-320. [[LINK](#)]

Using a commercially available thermal imaging system, study authors documented a total of 12 thermal anomalies in 9 of 114 patients at the time of admission to one of the study institution's ICUs over a 2-month period. In this study, researchers reported a significant decline in the incidence of deep-tissue pressure injury (DTPI) compared with historical incidence in the study institution. This is attributed to the use of a commercially available long-wave infrared thermal imaging system to identify thermal anomalies in anatomical areas predisposed to the development of DTPIs and to implement clinical interventions to mitigate or reduce the severity of emergent DTPIs.

CLINICAL APPLICATIONS



BOODOO C, PERRY JA, HUNTER PJ, DUTA DI, NEWHOOK SCP, LEUNG G, CROSS K. VIEWS OF PATIENTS ON USING MHEALTH TO MONITOR AND PREVENT DIABETIC FOOT ULCERS: QUALITATIVE STUDY. JMIR DIABETES. 2017 SEP 15;2(2):E22 [[LINK](#)]

Evidence suggests that mHealth can be an effective tool in diabetes self-management. mHealth presents an opportunity for the prevention and monitoring of DFUs. This study aimed to explore the views, attitudes, and experiences of a diabetic patient population with or at risk of DFUs regarding technology, mHealth, and the diabetic foot. We used a qualitative research approach using in-depth interviews with 8 patients with DFUs. mHealth continues to show potential in improving patient outcomes, and this study provides a foundation for designing interventions specific to a DFU population.

BOODOO C, PERRY JA, LEUNG G, CROSS KM, ISARANUWATCHAI W. COST-EFFECTIVENESS OF TELEMONITORING SCREENING FOR DIABETIC FOOT ULCER: A MATHEMATICAL MODEL. CMAJ OPEN. 2018;6(4):E486-E494. PUBLISHED 2018 OCT 18. [[LINK](#)]

The use of telemonitoring in the diabetic lower extremity can offer patients better quality of life and can be cost-effective compared to current Canadian screening practices. Future work should focus on developing and validating technologies based on objective outcome measures for remote monitoring of the diabetic foot.

WALLACE D, PERRY J, YU J, MEHTA J, HUNTER P, CROSS KM. ASSESSING THE NEED FOR MOBILE HEALTH (MHEALTH) IN MONITORING THE DIABETIC LOWER EXTREMITY. JMIR MHEALTH UHEALTH. 2019;7(4):E11879. PUBLISHED 2019 APR 16. [[LINK](#)]

To evaluate the potential application of mobile health (mHealth) to diabetic foot monitoring. We surveyed the self-management routines of a group of diabetic patients, as well as patient and clinician opinions on the use of mHealth in this context. Patient education or motivation and clinician training were identified as the major barriers to mHealth use in the diabetic lower extremity, which may be a viable mechanism to improve DFU monitoring practices.

MOBILE HEALTH



