Canon

## Dermatology Ultrasound Clinical Case Study

# Ultrasound assessment of Burns

## Introduction

Burns are one of the most common types of traumatic injuries in the world with an estimated incidence of 1 per 100,000 people[1]. The depth of burn scar injury plays an important role in determining treatment and healing potential. Epidermal and superficial partial-thickness burns are usually managed conservatively and generally heal without scarring whilst deep partial-thickness and full thickness burns often require surgical intervention[2].

A link between burn depth and microvascular blood flow has also been well established[3]. This relationship suggests that deeper wounds have less vascular perfusion than superficial ones[2]. There are a variety of modalities employed to classify burns including biopsy with histological analysis, thermography, vital dyes, video angiography and laser Doppler techniques[3]. However, these methods can be invasive and can also have limitations.

Scar formation from burn injuries do not only cause cosmetic concerns. Pain, itchiness, dysesthesia, inflammation and functional impairment are additional co-morbidities that can be experienced by burns patients[4]. Laser therapy is a recent advancement in scar treatment which involves creating a laser induced thermal injury that induces a remodeling response to the exposed area[4].

Recently, high frequency ultrasound is available as a means to assess dermal depth as well as burn wound healing[5]. Ultrasound is able to identify dermal adnexal structures with improved resolution, hence potentially providing accurate visualization of deep dermal micro-circulation[2].

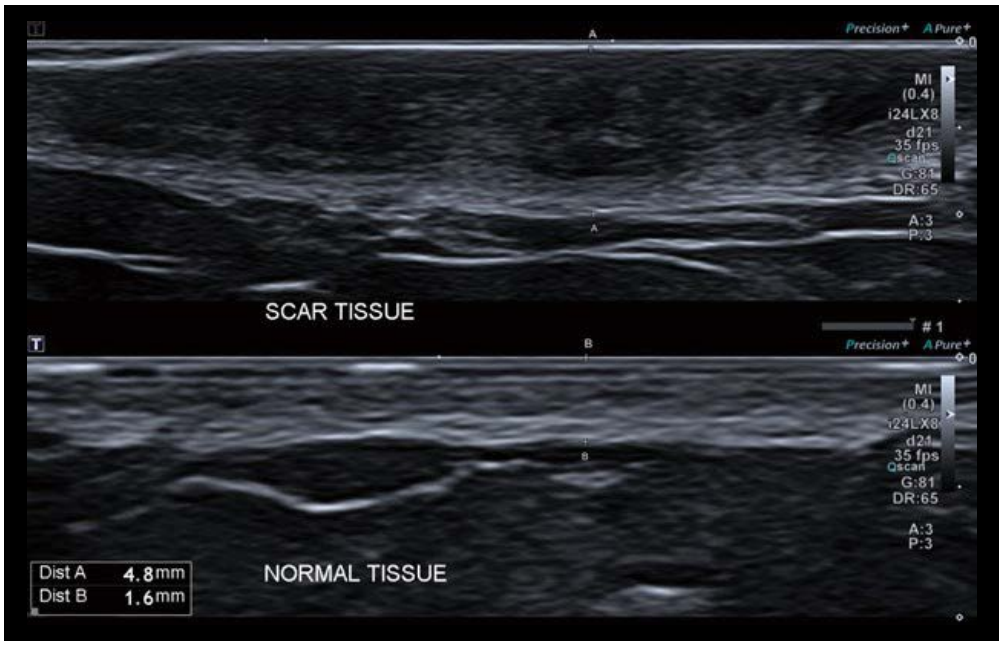


**Figure 1** Comparison of normal dermal tissue vs. epidermal scarring caused by burns. Canon's PLI-2004BX linear transducer provides high frequency imaging for maximal spatial resolution. Tissue echotexture differences are well demonstrated even at sub-centimetre depths.

## Case Study

Experimental assessment of burn patients receiving laser therapy have been performed at a large, Australian paediatric hospital using Canon's Aplio i800 ultrasound system.

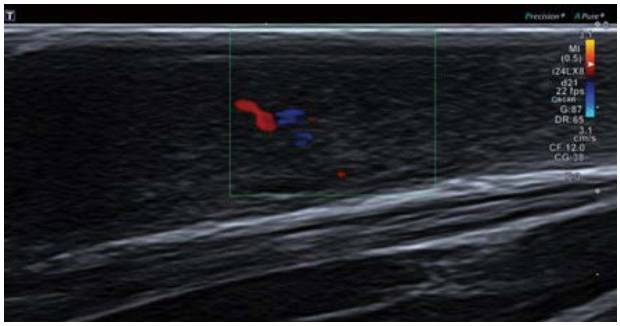

**Figure 2** Standard Color Doppler Imaging assessment of dermal scar tissue.

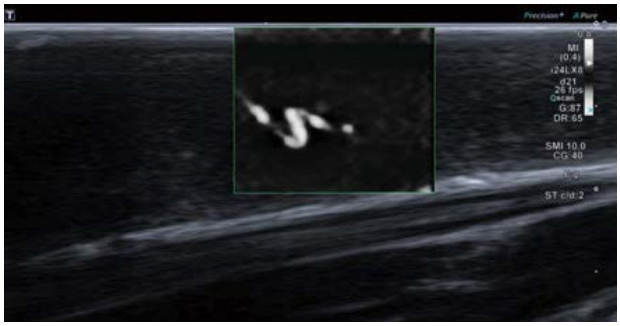

**Figure 3** Monochrome SMI (mSMI) exhibits unchallenged sensitivity to better demonstrate tiny vessels in the dermal layer with excellent spatial resolution.

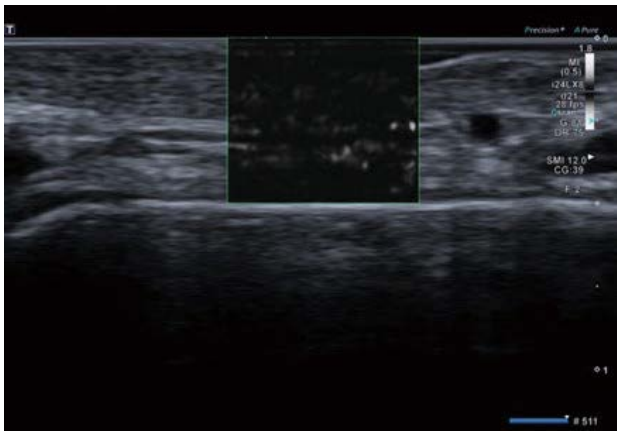

**Figure 4** mSMI assessment of scar tissue prior to laser therapy.

**Figure 5** An increase of dermal vascularity is demonstrated following laser therapy. The Vascularity Index (bottom right corner), gives the SMI (i.e. blood flow) to B-mode (i.e. no blood flow) ratio within a determined area. It allows the ability to quantitatively measure and compare blood flow presence over time.

## Discussion

The use of high frequency ultrasound in the assessment of burn depth and perfusion is a poorly explored territory and its clinical utility remains to be determined[4]. Canon's new, one of a kind 24 MHz matrix linear transducer (PLI-2004BX) takes assessment of the skin surface to a new level by providing excellent spatial resolution at sub-centimetre depths. Superb Micro-vascular Imaging (SMI) is a unique Doppler technology designed to filter out noise and detect low flow in tiny vessels with unprecedented spatial and temporal resolution as well as superior sensitivity. It comes standard with the Aplio i800. SMI has two display modes:

- Color SMI (cSMI) uses a ROI display box that displaying SMI pixels to represent blood flow.

- Monochrome SMI (mSMI) uses a ROI display box that subtracts out the B-mode image to allow even greater flow visualization sensitivity. A B-mode reference image is often displayed beside the mSMI image.

The combination of the 24 MHz transducer and improvements in SMI sensitivity and resolution on the Aplio i800, sub-millimetre vessels are demonstrated with unrivalled clarity. The additional use of the Vascularity Index function, allows the ability to quantitatively assess blood flow signals by calculating the SMI to B-mode pixel ratio in a fixed or customized area.

Canon's Aplio i-series innovation pushes the boundaries of the application of ultrasound in the imaging of superficial structures. Not only in burn assessment but extending into other dermatology, phlebology and musculoskeletal applications.

**References:**


1. Lee, C.L., Dretzke, J., Grover, L., Logan, A. & Moiemen, N (2016); "A Systematic Review of Objective Burn Scar Measurements" Burns and Trauma 4:14
2. Devgan, L., Bhat, S., Aylward, S. & Spence, R.J (2006); "Modalities for the Assessment of Burn Wound Depth" Journal of Burns and Wounds, 15/2/2006
3. Monstrey, S., Hoeksema, H., Verbelen, J., Pirayesh, A. & Blondeel, P. (2008); "Assessment of Burn Depth and Burn Wound Healing Potential" Burns, 34:761-769
4. Krakowski, A.C., Totri C.R., Donelan M.B. & Shumaker P.R. (2016); "Scar Management in the Paediatric and Adolescent Populations" Paediatrics Vol.137, No.2
5. Thatcher, J.E., Squires, J.L., Kanick, S.C., King, D.R., Lu, Y., Wang, Y., Mohan, R., Sellke, E.W. & DiMaio, J.M. (2016); "Imaging Techniques for Clinical Burn Assessment with a Focus on Multispectral Imaging" Advances in Wound Care, Vol. 5 No, 8:360-376

CANON MEDICAL SYSTEMS CORPORATION
https://global.medical.canon

©Canon Medical Systems Corporation 2021. All rights reserved.
Design and specifications are subject to change without notice.
Model number: TUS-AI800 MCSUS0008EA 2021-05 CMSC/SZ/Produced in Japan

Canon Medical Systems Corporation meets internationally recognized standards for Quality Management System ISO 9001, ISO 13485.
Canon Medical Systems Corporation meets the Environmental Management System standard ISO 14001.

Aplio and Made for Life are trademarks of Canon Medical Systems Corporation.

The clinical results described in this paper are the experience of the author.
Results may vary due to clinical setting, patient presentation and other factors.

Made For *life*