

shortly after injury. SFDI is also capable of measuring physiological parameters including local tissue oxygen saturation, oxygenated hemoglobin and deoxygenated hemoglobin, but none were capable of reliably distinguishing burn categories over the four days we observed the wounds. We do expect that these parameters will have the potential for quantifying the dynamic healing response of burns typically seen about one week after the initial injury [45]. We expect that this capacity will be interesting within the context of looking at various burn wound healing interventions

One challenging aspect of making measurements in a clinical environment is the intrinsic variability in skin from patient to patient. A benefit of examining burn wounds is that the damage resulting from the burn process likely overwhelms this variability. Differences between individuals related to differences in pigmentation, skin hydration, and the changes in collagen associated with aging are likely overwhelmed by destruction of the epidermal layer where melanin resides, edema creating changes in water concentration, and the denaturation/hyalinization of collagen respectively. A unique facet of burn wound care in the United States is that more than 75% of the cases that require hospitalization are handled by one of the 127 hospital burn centers [5]. If the proposed work provides significant improvement over the current standard of care, it would be reasonable to get this technology into a large number of burn centers so that the benefits could be seen by the most patients. The information provided by SFDI and LSI also has the potential to be used for more than just burn wound categorization. By quantifying several aspects of tissue health, this technology has the ability to carry out quantitative longitudinal research oriented around assessment of the efficacy of different burn treatment options.

5. Conclusion

We have investigated two non-invasive tools: SFDI, capable of characterizing in-vivo scattering and absorption changes, and LSI, capable of characterizing blood flow changes, as methods to non-invasively predict burn severity. Burns ranging from superficial partial thickness to full thickness in a porcine model were monitored over three days. Here, we have demonstrated that monitoring changes in blood flow can distinguish superficial partial and deep partial thickness burns at one hour after burn injury. Additionally changes in the reduced scattering coefficient can differentiate superficial partial, deep partial and full thickness burns at one hour after injury. These techniques have the potential to predict burn severity at the earliest stages, which is critical for guiding treatment options.

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