Documentation of wound surface area and fluorescence bacteria characteristics using a point-of-care, hand-held imaging device

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INTRODUCTION

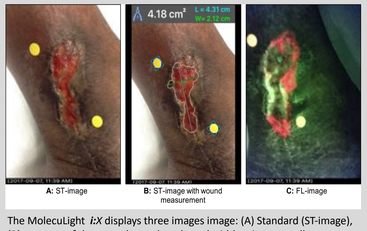
- Wound surface area reduction is used as a predictor of healability and an indication of the care protocol efficacy[1,2].
- The variability, of up to 40%, in standard length x width estimation of wound surface area is unacceptable on a measurement on which care decisions are being based.
- Digital planimetry tools have been demonstrated to be more accurate and consistent than conventional methods in documenting the progress of a wound through the care continuum[1,2].
- Here we present the use of a hand-held, non-contact wound imaging device that includes fluorescence imaging and documentation of bacteria and software that estimates and documents the area of a wound, using a proprietary algorithm or manual trace functionality.

METHODS

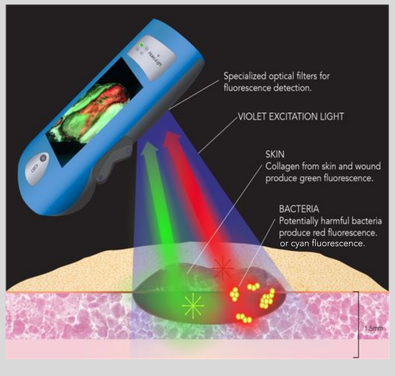
- 25 wounds were imaged using a non-contact, hand-held device at the point-of-care.
- Wound surface area was measured and documented for up to 6 months.
- Fluorescence imaging of the wounds was also performed to assess presence of bacteria using the same handheld imaging device[3].

WOUND IMAGING

The MolecuLight *i:X* Imaging Device



The MolecuLight *i:X* displays three images image: (A) Standard (ST-image), (B) measure of the wound area, length, and width using two yellow calibration stickers places around the wound, and (C) Fluorescence (FL-image) of the wound allowing visualization bacterial fluorescence.



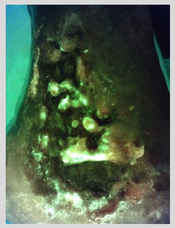
<u>Bacterial Fluorescence Imaging</u>

- When excited by 405 nm violet light, tissues fluoresce **green** while bacteria fluoresce **red** (e.g. *Staphylococcus aureus*) or **cyan** (e.g. *Pseudomonas aeruginosa*).
- This enables real-time, point-of-care detection and localization of bioburden (≥ 10^4 CFU/g) within and around wounds[3,4].

RESULTS

Inaccuracy of SoC Measurement

ST-image
with wound measurement



FL-image

The standard of care estimation of wound area using length x width measurement, over estimated the area of all wounds in this study.

The irregular wound border of this 90 year old male patient with a venous leg ulcer on his left calf would have been overestimated by 46.3 % with traditional estimation.

<u>Standard of Care (SoC) Measure</u>

Wound area = length x width
= 8.99 cm x 3.29 cm
= 29.6 cm²

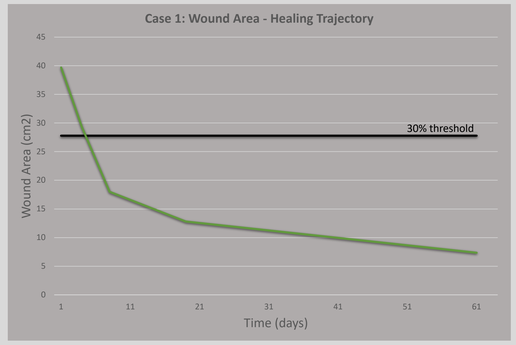
<u>MolecuLight *i:X* Measure</u>

Wound area = 15.9 cm²

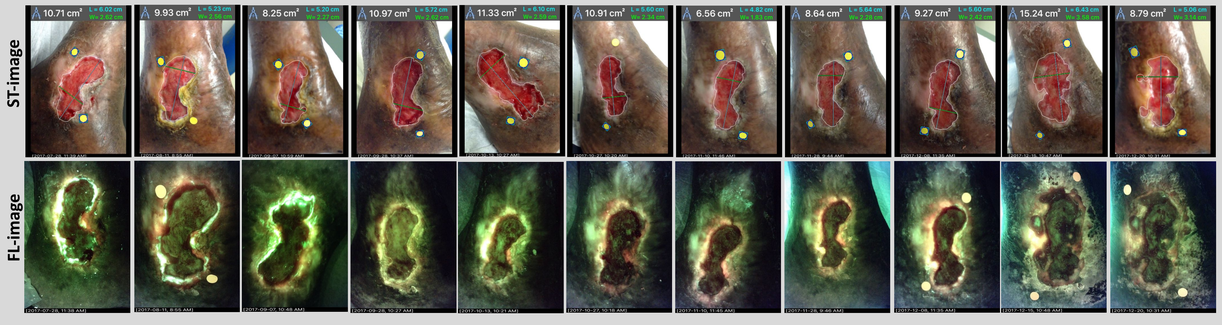
$$\%\ difference = \frac{SoC - i{:}X}{SoC} \times 100 = 46.3\%$$

Case 1: Healing Trajectory

The care paradigm of this 72 year old venous leg ulcer patient included wound cleansing, sharp debridement, and compression dressing. The wound decreased in size by 30% in just 8 days, meaning that it was projected to progress through the continuum of healing without complication.



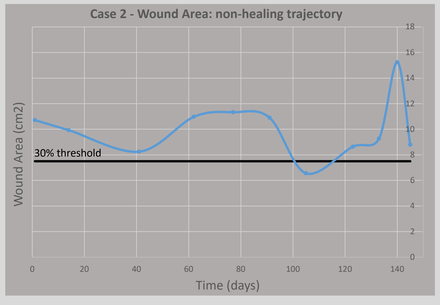
Case 2: Non-Healing Trajectory



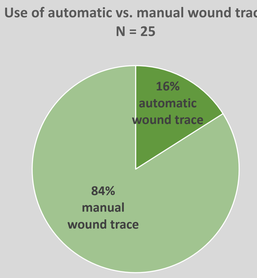
The care paradigm for this 74 year old venous leg ulcer patient includes debridement, infection management with antimicrobial cleansing and compression bandages. The wound area failed to decrease by 30% in 4 weeks, and therefore the care paradigm was re-assessed. Tissue samples obtained at 91 and 140 days confirmed polymicrobial presence as indicated by the presence of red fluorescence in the FL-images.

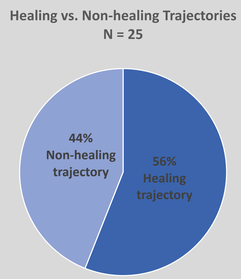
The lack of progress of the wound between 62 – 91 day time points again prompted for a re-assessment of the care paradigm, one which rapidly decreased the size of the wound over a two week period.

The wound increased in size dramatically at 140 days, again prompting a change in care including sampling of microbiological load. The wound again experienced a steep decrease in wound area.



RESULTS





The MolecuLight i:X imaging device allows for automatic and manual tracing of the wound, of which the manual trace was most frequently used in this patient population.

CONCLUSIONS

Accurate and convenient wound area measurement in a point-of-care, hand-held imaging device is helpful in documenting wounds and predicting their healability in an objective, standardized manner.

REFERENCES

1. Gethin 2006, Wounds
2. Khoo et al. 2016, Wounds
3. Rennie et. al 2017, J Wound Care
4. DaCosta et. al. 2015 PLoS ONE

DISCLAIMER

This work has been made possible by sponsorship from MolecuLight, Inc,

The Scarborough Hospital — Local in Spirit. Global in Care.

Rouge Valley HEALTH SYSTEM