Treatment Selection

Illuminating the Evidence

Publication Summary

Jeffery SLA. Proceedings of SPIE 2019.*

MolecuLight®

The utility of MolecuLight bacterial sensing in the management of burns and traumatic wounds

A review of the evidence for fluorescence guided sampling, debridement, antimicrobial stewardship and timing of grafts in burn and trauma wounds

Overview

- This publication reviews use of the MolecuLight ***i:X*** fluorescence imaging device for bedside visualization of endogenous fluorescence from bacteria at clinically significant loads (moderate-to-heavy growth).
- The authors describe the device's capability to visualise regions of bacteria, not observed in a standard examination, and how this capability has led to improved sampling and enabled treatment and debridement specifically targeted to regions of bacterial burden in studies to date.

Meta-analysis

- A meta-analysis of all studies to date assessing MolecuLight ***i:X*** guided sampling of burn wounds was performed. This included four studies and a total of 67 wounds.
- This analysis reported improvements in all diagnostic accuracy measures vs. the current standard of care.
- MolecuLight ***i:X*** images of burn wounds had average diagnostic accuracy measures for bacterial detection as follows: sensitivity of 92%, specificity of 81%, accuracy of 86%, positive predictive value (PPV) of 82%, and negative predictive value (NPV) of 85% (**Figure 1**).

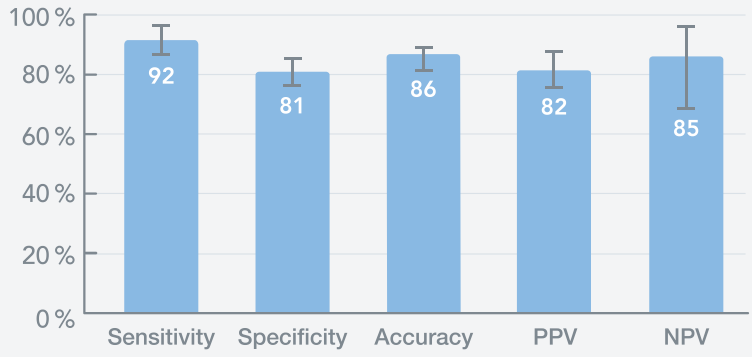

Figure 1. Meta-analysis of diagnostic accuracy measures reported from MolecuLight ***i:X*** guided swab-based sampling of burn wounds.

Note: The study author noted that swab-based sampling, used across all four studies in the meta-analysis, does not enable subsurface sampling and that this limitation likely led to under-reporting of the fluorescent images' capabilities.

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Illuminating the Evidence (continued)

Case Series

- A case is described in which fluorescence images assisted the clinician in preventing antibiotic over-usage in a contact burn which exhibited multiple regions of bacterial (red) fluorescence, confirmed as heavy growth of *Staphylococcus aureus*. Images guided targeted cleaning and debridement of those regions, application of a topical antibiotic in regions where the bacterial (red) fluorescence persisted, and regular monitoring of the wound. The wound eventually healed without oral or systemic antibiotics.
- Three cases are described (1 necrotizing fasciitis and 2 lower limb amputations) in which the device guided the timing of skin grafts. In two of these cases, MolecuLight ***i:X*** images halted the planned grafts and guided additional interventions (debridement or antimicrobial treatments) when bacterial fluorescence was detected. Wounds were swabbed under fluorescence guidance and microbiology confirmed the presence of bacterial pathogens in each case (*P. aeruginosa*, *E. coli*, *P. mirabilis*).

Health Economic Analysis

- The author states that MolecuLight ***i:X*** images of one patient's wound prevented a skin graft operation which would not have been successful, avoiding the costs of the operating room, staff for the procedure, and a five-day hospital stay, totaling **$19,550 USD**[1-3] (**Figure 2**).
- The author notes that these are conservative figures, which do not include the additional health care costs of treating a failed, infected skin graft, which almost certainly would have developed in this stump had a graft been performed.

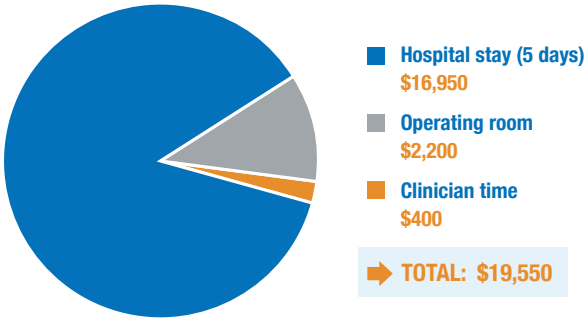

Figure 2. Estimated costs of a skin grafting procedure which was avoided based on real-time information from MolecuLight ***i:X*** fluorescence images.

Note: Costs were originally reported in British pounds; they have been extrapolated to USD based on 2018/2019 data[1-3].

Study Citation

*Steven Jeffery. The utility of MolecuLight bacterial sensing in the management of burns and traumatic wounds. Proceedings of SPIE 10863, Photonic Diagnosis and Treatment of Infections and Inflammatory Diseases II, 1086304 (7 March 2019); doi: 10.1117/12.2504377.

References

1. Childers CP & Maggard-Gibbons M. Understanding costs of care in the operating room. JAMA surgery, 2018: 153(4):e176233.
2. 2019 CMS Inpatient Final Rule BOR AOR MS-DRG Files (Vascular skin graft to treat inpatient cost/day).
3. 2019 April CMS Relative value scale and Agency for Healthcare Quality and Research for percent of Medicare and commercial patients.