INTRODUCTION

Wound cleansing is the most ubiquitous method to maintain optimal wound hygiene as it is available at all clinical settings and skill levels. The periwound is often a neglected area, but serves as a source for microbial recontamination if not adequately cleansed.

Fluorescence imaging has been used to visualize fluorescing bacteria in real-time at the bedside using a non-contact device2-4. This study reports the use of bacterial fluorescence imaging to assess bioburden in the wound and periwound area to optimize wound hygiene using a new cleansing agent, using lower concentration sodium hypochlorite (NaOCl), compared to standard practice.

METHODS

Bacterial Fluorescence Imaging

- 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 wounds2-4.

RESULTS

Visualization of bacterial load can be incorporated into routine wound care to optimize wound hygiene by guiding targeted cleansing steps.

Case 1: 72 year old male treated with NPWT after midline surgery complication
- Distinct odour observed at the time of assessment
- Swab obtained from the wound bed prior to fluorescence imaging were negative for bacterial growth
- Red fluorescence indicates presence of bioburden

Case 2: Skin Tear
- Saline cleanse was moderately effective in removing red fluorescent bacteria
- NaOCl cleanse successfully removed red fluorescent bacteria

Case 3: DFU
- Red fluorescing bacteria present at the wound bed and periwound site
- Saline cleanse did not eradicate fluorescent bacteria
- NaOCl cleanse successfully removed all red fluorescence

Case 4: VLU with necrosis
- Cleansing with saline did not remove cyan or red fluorescent bacteria
- NaOCl was very effective on cyan fluorescing bacteria
- Red fluorescence remained after NaOCl cleanse and the patient required debridement

REFERENCES


CONCLUSIONS

- Bacterial (red and/or cyan) fluorescence was present in the periwound area in 100% of wounds. The fluorescence persisted after initial, standard of care cleansing with saline.
- This is concerning given that red fluorescence equates to a bacterial load of 10^4 CFU/g or higher (i.e. moderate/heavy bacterial load)3.
- 30% of wounds required debridement after cleansing with low concentration sodium hypochlorite solution (NaOCl)
- Thus, results of this study demonstrate that bacteria is located outside of the wound bed, and poses a cross-contamination risk. Current best cleansing practices using saline:
  1. do not maximize removal of bioburden, and
  2. leave behind an unacceptably high bacterial load (≥ 10^6 CFU/g) that is considered detrimental to wound healing5.
- Incorporation of bacterial fluorescence imaging into routine wound care resulted in more aggressive cleansing. This specifically targeted regions of bioburden, and indicated to the clinician if additional therapy (e.g. debridement) was required to fully eliminate the bioburden.
- Results highlight the potential of bacterial fluorescence imaging to dramatically improve current cleansing practices by enabling point-of-care, bioburden based decision making on when cleansing is sufficient, and when additional techniques are required to remove bioburden.