

Use of a Novel Bioresorbable Wound Matrix Dressing with a Polymeric Coating Containing Nanoparticle Silver in the Treatment of Diabetic Foot and Venous Leg Wounds



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Abstract

Wound healing is a complex orderly process of cellular infiltrate and matrix deposition. Chronic wounds develop in patients with comorbidities and compromised immune systems. Infection and bacterial burden are major contributors to wound chronicity¹. The concept of an economical, intimate contact wound bed dressing with capacity to provide antimicrobial, antibiofilm, or pain relief properties is unique in dressing technologies. For this poster we observed the effects of a silver wound matrix material with these properties. Silver is widely used as an antimicrobial addition to wound dressings due to its broad-spectrum antimicrobial properties against bacteria, yeast, and fungi common in wounds². Silver dressings have demonstrated activity against wound biofilm but intimate contact with the wound bed is required in order for them to be effective³. Most dressings are effective at killing or inhibiting bacterial proliferation within the dressing. Few if any actually release silver ions into the wound fluid or have enough contact with the wound bed to have any effect on biofilms. Argyria, or discoloration caused by deposition of silver particles in the skin, wound bed sensitivity, or injury to fibroblasts in the wound bed is frequently seen with long-term use of high concentration silver dressings⁴.

Methodology

We present 6 cases in which a new antimicrobial wound matrix was used to improve healing and decrease bacterial burden in patients with chronic wounds. The dressing consists of an ultrathin bioresorbable matrix, which contains proprietary silver nanoparticle technology with a non-toxic low silver content. Upon application, the dressing immediately adsorbs to the wound surface and forms a soft bioactive material that intimately conforms to the irregular wound bed contours to stimulate granulation, reduce bacterial proliferation, and maintains a moist healing environment.^{7,8} Silver in the matrix kills 99.99% of bacteria for at least 3 days while employing as little as 1/100 of the silver found in conventional dressings or topical solutions.⁹ Low silver content reduces the risk of silver toxicity and staining, and inhibition of cell proliferation seen with high concentration alternatives.¹⁰ The matrix provides a template for cellular growth and is resorbed into the wound bed over 5-7 days. The dressing is safe for use for burns, donor sites, diabetic and venous ulcers, and pressure sores.

Wound beds were evaluated over several dressing changes for clinical signs of wound biofilm or surface bacterial proliferation: Delayed healing, drainage increase, friability of granulation tissue, discoloration, slough formation increased odor, size increase, new areas of breakdown, and local erythema and warmth.^{5,6} Application over CTPs did not appear to have a negative effect on the effectiveness of the graft material.

Wound Responses

Figure 1: R VLU 8/26/19



Figure 3: L VLU 8/26/19



Figure 5: Vasculitis 9/23/19



Figure 1a: R VLU 9/23/19



Figure 3a: L VLU 9/13/19



Figure 5a: Vasculitis 9/27/19



Figure 2: R VLU 9/3/19



Figure 4: L DFU 9/9/19



Figure 6: R VLU 7/3/19



Figure 2a: R VLU 10/2/19



Figure 4a: L DFU 9/23/19



Figure 6a: R VLU 10/2/19



Discussion

Table: Wound measurements and results

| Patient Number | Wound Measurements/ Area (cm) | % Biofilm | Drainage Increase or Decrease | Friability | Slough Type | % Granulation | Redness or Warmth |
|----------------|-------------------------------------|-----------|-------------------------------|------------|-------------|---------------|-------------------|
| #1 | 10 x 11 110 cm ² | 20% | High | Mod | Leuko | 50% | Mild |
| #1a | ~ 7 x 1 7cm ² | 0% | ↓ | None | None | 100% | None |
| #2 | 5.6 x 1.5 8.4 cm ² | 10% | Mod | Marked | Bio | 100% | Mild |
| #2a | 0.4 x 0.8 .32 cm ² | 0% | ↓ | None | None | Epith | None |
| #3 | 2.0 x 2.5 5 cm ² | 0% | Low | Min | None | 100% | None |
| #3a | 0 | 0% | ↓ | None | None | Epith | None |
| #4 | 7.2 x 5.6 40.32 cm ² | 90% | High | Min | Fibro | 50% | Mod |
| #4a | 5.0 x 2.4 12 cm ² | 50% | ↓ | Min | Fibro | 100% | None |
| #5 | ~ 5.6 x 0.7 3.92 cm ² | 0% | Mod | High | Leuko | 80% | Mod |
| #5a | 1.0 x 0.7 0.7 cm ² | 0% | ↓ | None | None | 5% | None |
| #6 | 3.0 x 3.0 9 cm ² | 40% | Mod | Mod | Fibro | 60% | Mod |
| #6a | 0.3 x 0.5 1.5 cm ² | 0% | ↓ | None | None | 0% | None |

| Patient Number | Wound healing rate per week | Patient number | Wound healing rate per week |
|----------------|------------------------------|----------------|-----------------------------|
| 1 | 25.75 cm ² / week | 4 | 14.16 cm ² /week |
| 2 | 2.02 cm ² / week | 5 | 3.85 cm ² /week |
| 3 | 2.5 cm ² /week | 6 | 0.577 cm ² /week |

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