Objective Quantitative Analysis of Wound Bed Preparation for Pressure Ulcers and Venous Leg Ulcers Utilizing a Hydroconductive Wound Dressing

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The concept of wound bed preparation provides a systematic approach to removing the barriers to wound healing and enhancing the effects of wound therapies.[1] An effective product for wound bed preparation needs to facilitate removal of nonviable tissue and debris, decrease excessive exudate, decrease the tissue bacterial level, remove deleterious chemicals, and set the stage for healing.[2] Spruce[3] suggested in a series of cases that the hydroconductive dressing, Drawtex (SteadMed Medical LLC, Ft. Worth, TX), was such a product and could be used effectively within the wound bed preparation framework.

Serial observation of the wound by the clinician has historically been the subjective evaluation by which wound bed preparation was measured. A more objective, quantitative analysis is necessary to document the effectiveness of a treatment in performing wound bed preparation. We have used an advanced pattern recognition software algorithm utilizing artificial intelligence to analyze digital wound images (iCLR technology, Elixr, Imago Care Ltd, London, UK) on a series of 26 pressure ulcers and 15 venous leg ulcers being treated with Drawtex hydroconductive wound dressing to evaluate the effectiveness of wound bed preparation. This technology calculates wound measurements, including area, circumference, width, and height.[4] It analyzes the composition of the wound bed. Utilizing the digitized wound photograph, the program divides the wound into three tissue-type classifications, each

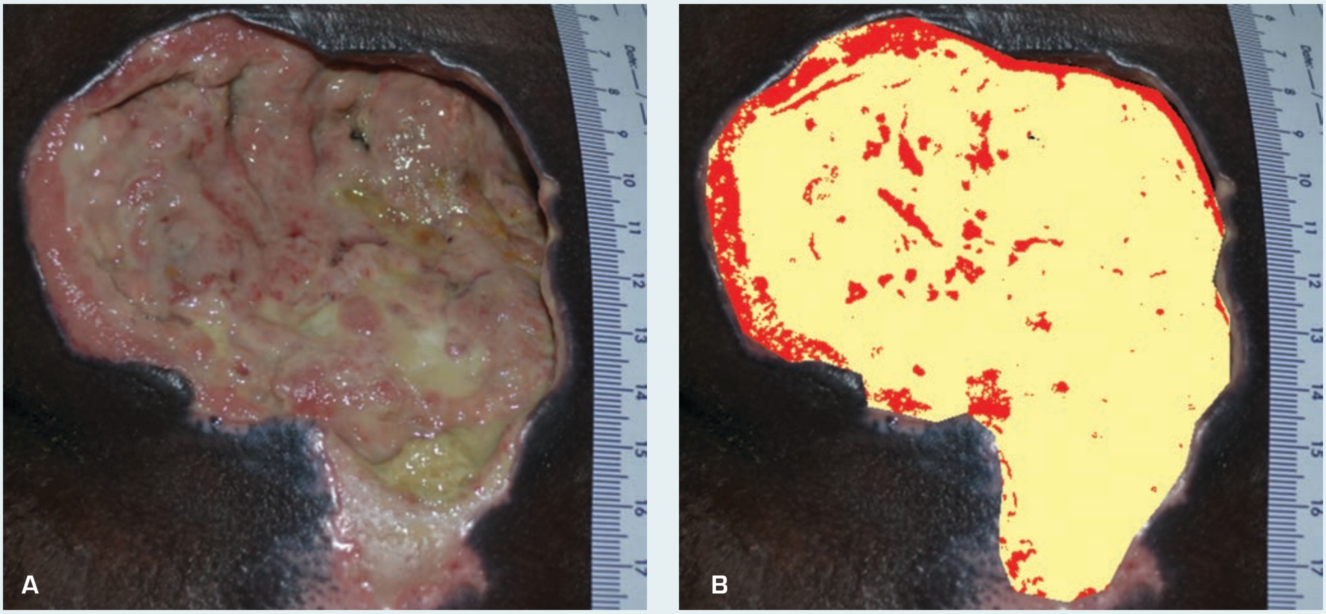

Figure 1A,B. Photo and scan of pressure ulcer on day 0 prior to start of Drawtex treatment.

Pearls for Practice is made possible through the support of SteadMed Medical, LLC, Fort Worth, TX (www.steadmed.com). The opinions and statements of the clinicians providing Pearls for Practice are specific to the respective authors and not necessarily those of SteadMed Medical, LLC, OWM, or HMP Communications. This article was not subject to the Ostomy Wound Management peer-review process.

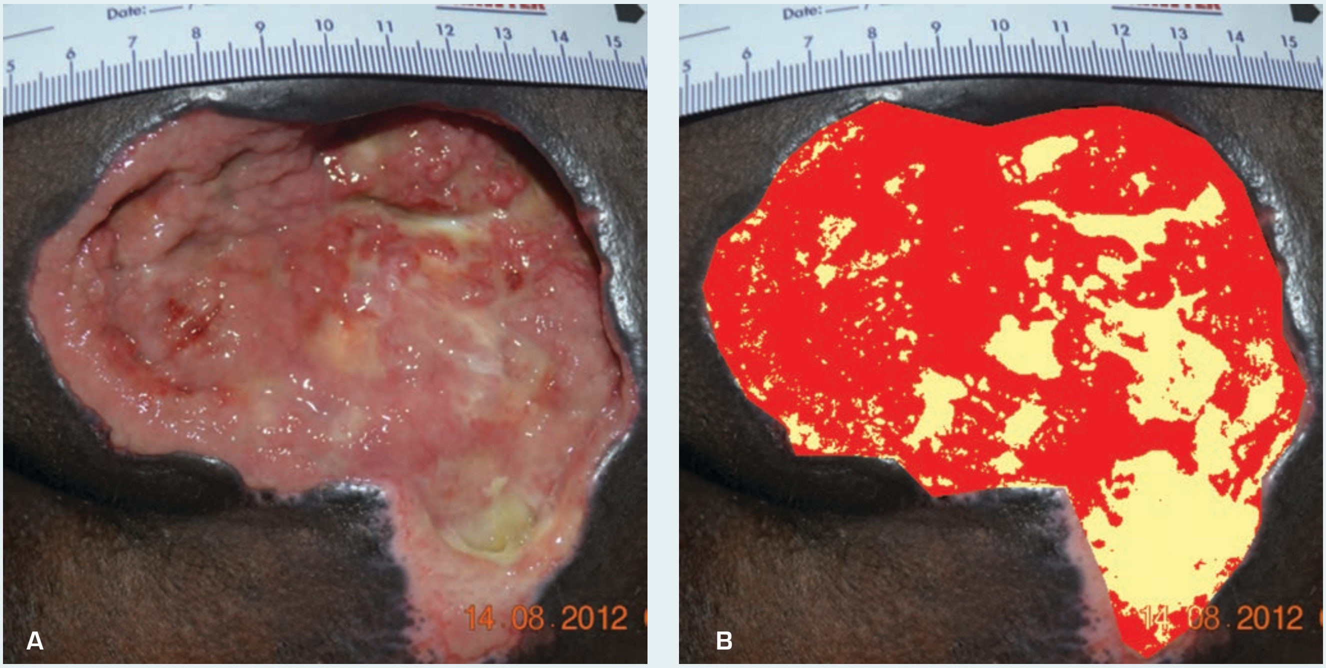

Figure 2A,B. Photo and scan of pressure ulcer on day 8 after treatment with Drawtex.

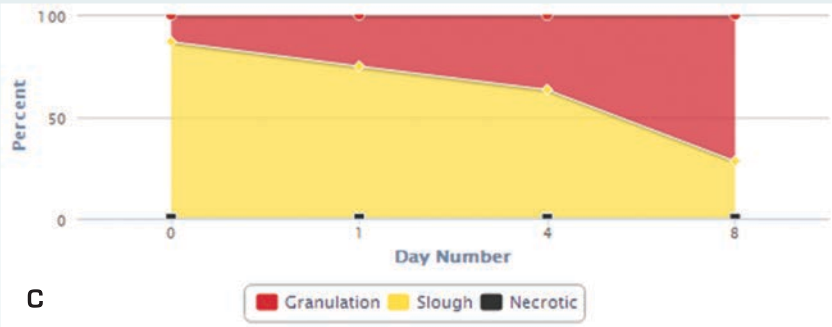

Figure 2C. Tissue analysis graph demonstrating removal of slough and increase in granulation tissue.

represented by a distinct color; necrotic tissue is represented as a black color, fibrin and slough as a yellow color; and granulation tissue as a red color. This algorithm has been demonstrated to be objective, reliable, reproducible, qualitative, and quantitative.[5]

The hydroconductive dressing utilized in these two series of patients was useful for wound bed preparation, and the degree of wound bed preparation was objectively quantified by digitized wound image analyses.

Case Example: Pressure Ulcer

A 32-year-old man was admitted to the Trauma ICU with a gunshot wound. He developed a sacral pressure ulcer that was treated with negative pressure wound therapy (NPWT) before the decision to use hydroconductive dressings. Multiple layers of Drawtex were changed on alternate days until wound bed preparation was deemed acceptable. Figure 1a shows the ulcer on day 0, covered by debris and slough. In Figure 1b, the slough is demonstrated by the yellow color. After 8 days of treatment with Drawtex, the amount of slough is greatly decreased, and the scan shows an increase in the red color (see Figure 2a,b). The corresponding tissue scan analysis shows a decrease in the yellow color and an increase in the red color over the 8-day period (see Figure 2c).

Case Example: Venous Leg Ulcer

A 48-year-old man with a 7-year history of leg ulcer treated with multiple modalities including NPWT was admitted with cellulitis of the leg and systemic sepsis. He was started on systemic antibiotics; local therapy with a hydroconductive dressing changed Monday, Wednesday, and Friday; and compression therapy. Within 15 days, the wound bed was well-prepared with 100% granulation tissue. Figure 3a shows the ulcer covered with slough, and Figure 3b demonstrates the corresponding scan with only sparse areas of red granulation tissue. After 9 days of treatment with Drawtex, the amount of remaining slough is minimal, and the granulation tissue covers almost the entire wound (see Figure 4a,b). Tissue scan analysis shows the increase of granulation tissue demonstrated by the increase in red color over time (see Figure 4c).

Utilizing the imaging system in 41 patients with chronic wounds, wound bed preparation success or failure was successfully documented serially over time. The use of the hydroconductive dressing facilitated removal of nonviable tissue debris and slough, leaving the healthy granulation tissue intact. ■

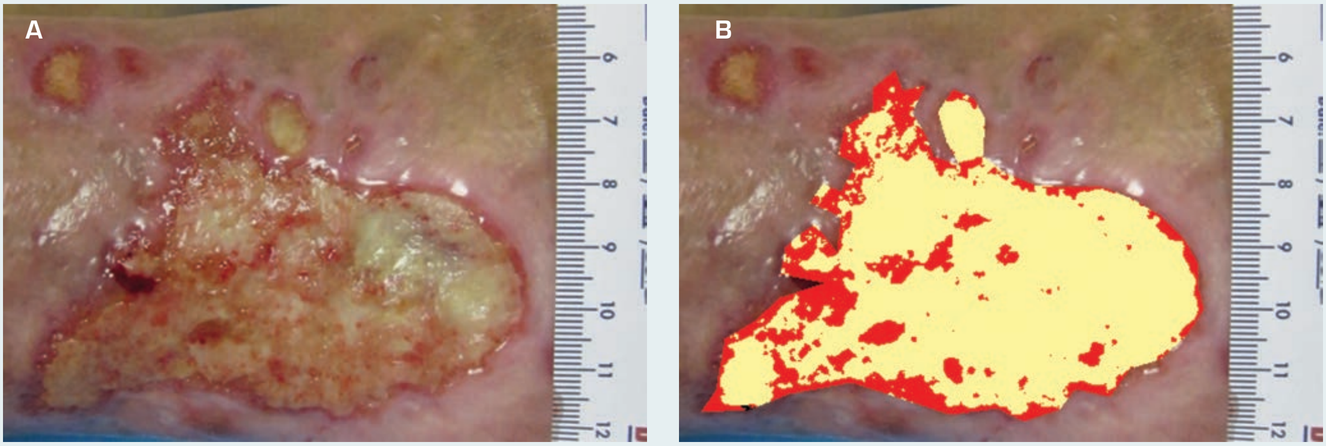

Figure 3A,B. Photo and scan of venous leg ulcer on day 0 prior to start of Drawtex treatment.

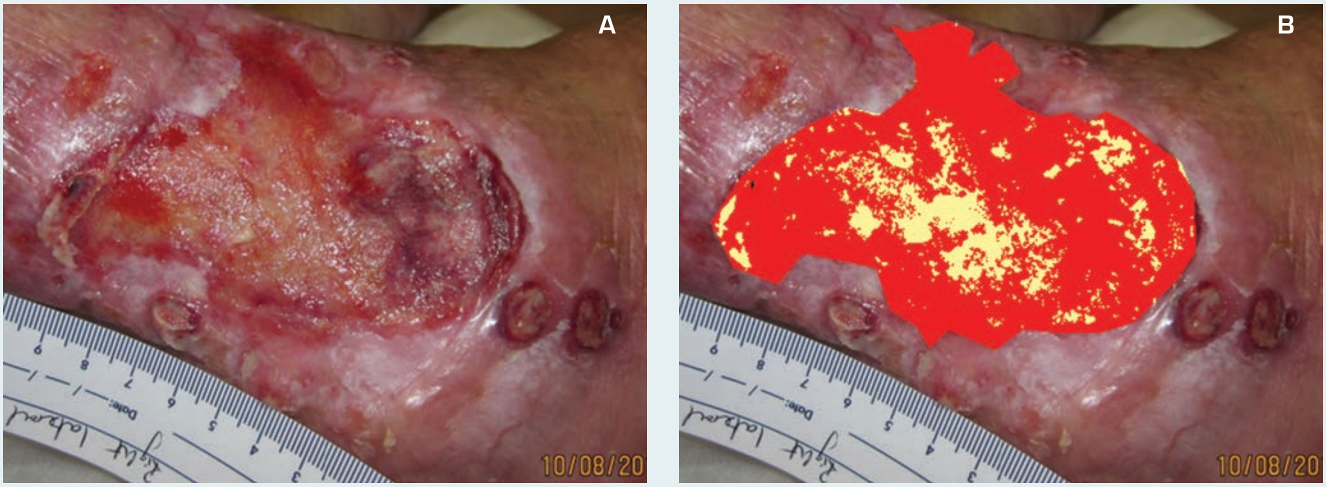

Figure 4A,B. Photo and scan of venous leg ulcer on day 9 after treatment with Drawtex.

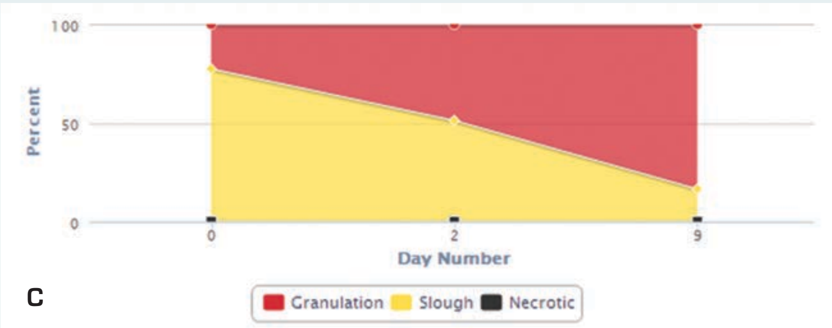

Figure 4C. Tissue analysis graph demonstrating removal of slough and increase in granulation tissue.

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