Analysis of Wound Bed Documentation in Advanced Wound Care Using Drawtex, a Hydroconductive Dressing With LevaFiber Technology

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The oldest medical text, the Sumerian tablet, written in 1600 BC, contains treatments thought to date back to 3000 BC.[1] Because infection was almost always present in the wounds at that time, suppuration was considered a necessary phase in wound healing for over 3,500 years. In the 1860s, Lister demonstrated that infections were not a normal event in wound healing. Infection was recognized as caused by bacteria, and he promoted the use of carbolic acid as an antiseptic in surgery and for the treatment of wounds with carbolic acid-soaked dressings.[1] His theory was supported by a fall in the infection rate and morality in wounded patients.

The concept of moist wound healing was introduced in 1962 by Winter.[2] Maintaining the proper moisture level in a wound has now been accepted as important in promoting a favorable wound healing environment.[3]

The role for debridement has been advanced via combat wound treatment during times of war. Debridement may be accomplished not only by sharp excision of necrotic and devitalized tissue, but also by using enzymatic, mechanical, autolytic, or hydroconductive techniques.

The development of advanced dressings is only a relatively recent phenomenon. In 1979, Turner listed the criteria for an ideal dressing.[4] Specialized dressings can be grouped into categories according to their functions and mechanisms of action. The overall goal of an advanced dressing is to restore, in a moist setting, the wound microenvironment to achieve the normal balance of cytokines, growth factors, and proteolytic mediators.

Advancements in wound care protocols and dressings created a need to analyze the results to determine the effectiveness of treatments. Given that serial observation of a wound by clinicians — the method traditionally used — is a very subjective evaluation, clinicians have searched for more objective wound evaluation methods.

An advanced pattern recognition software algorithm that uses artificial intelligence to analyze digital wound images to provide accurate wound measurements and tissue analysis has been developed (iCLR technology, powered by Elixr, Imago Care Ltd., London, UK). This technology calculates wound measurements including area, circumference, width, and depth, and analyzes the tissue-type composition of the wound bed.[5] Using the iCLR technology algorithm, wound tissue color features are acquired and parameters of statistical distributions are calculated for the different tissue types in a three-dimensional color space. In the digitized wound photograph, this program divides a wound into three tissue-type classifications: necrotic tissue, represented as a black color; fibrin and slough, represented as a yellow color; and granulation tissue, represented as a red color.

A new active hydroconductive non-adherent dressing with LevaFiber technology has been recently introduced (Drawtex, SteadMed Medical LLC, Ft. Worth, TX). Due to its unique propriety construction, the ability to remove large amounts of fluid and debris from the wound into the dressing is established. The dressing actively draws fluid away from the wound up to 150 cc/hour using an active capillary action, and retains its integrity when moist. It can also draw toxic wound exudates into the dressing, in effect detoxifying the wound.

Drawtex can help selectively debride wounds by removing adherent fibrin, slough and necrotic tissue while leaving healthy granulation tis-

Figure 1A. Skin tear after 7 days of Drawtex.

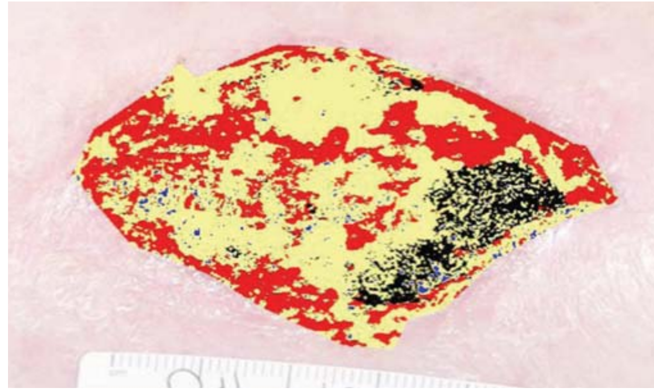

Figure 1B. Digital analysis of Figure 1A (red = granulation tissue, yellow = slough, black = necrotic tissue).

Figure 1C. Wound after 21 days of Drawtex.

Figure 1D. Digital analysis of Figure 1C (red = granulation tissue, yellow = slough, black = necrotic tissue).

sue in place. The rapid transfer of fluid into this dressing may sever the fibers of undenatured collagen that anchors the necrotic tissue to the wound surface itself. Termed "hydroconductive debridement," undesirable tissue is selectively removed, leaving healthy tissue intact, and is observed undisturbed in serial digital photo analysis.[6] The healthy granulation tissue was preserved over time and actually increased in percentage of the total wound volume, while the necrotic tissue and slough were selectively debrided, decreasing their volume in the wound analysis.[7]

The removed exudate may contain factors such as proteases and other factors or toxins that inhibit normal wound healing. In one study, matrix metalloproteinase-9 was demonstrated to be drawn into the dressing and was actively transported up to 7 cm from the wound edge.[8] It has been suggested that the fluid removed may also contain the plasma necessary to maintain the viability of a biofilm, helping to lead to its breakdown.[9]

The dressing was used in a variety of wound types. It was particularly effective in a patient with a highly exudating venous leg ulcer. Initially, it was placed in a double layer under compression and changed twice a week. After the drainage decreased, the dressing changes were done once a week until the wound healed. Success has also been noted in dry wounds. In this situation, wound moisture was maintained with ointments such as silver sulfadiazine. Typically the dressings were changed daily. Similarly necrotic tissue, fibrin, and slough are removed in dry wounds, and the wound fills in with healthy, vascular granulation tissue. In a published series of eight patients using independent digital wound analysis, the average area of necrotic tissue, fibrin and slough of all the patients were reduced by 36% in 1 week, 52% by week 2, and 77% in 3 weeks.[7] There also was a corresponding reduction of the wound area of 15% in 1 week, 35% by week 2, and 47% by week 3.

No adverse effects have been noted in any of the patients treated with this dressing. Further studies will be needed to find the role of this advance dressing for treating complex wounds. ■

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