Combination Therapy of a Bioresorbable Synthetic Polymer Matrix and an Ovine Collagen Dressing for Treatment of a Recurrent Venous Leg Ulcer: A Case Study

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Abstract

Wound healing of recalcitrant wounds is challenging, particularly among those with comorbidities and poor immune systems. Venous leg ulcers, caused by chronic venous insufficiency, have profound effects on patients' quality of life, especially when recurring. Complications include but are not limited to pain, leakage of exudate and odor, altered body image, and impaired mobility[1]. When the majority of conservative treatment options fail after several attempts, combination therapies may be utilized in order to maximize the benefits of all therapeutic agents used. In chronic wounds, the extracellular matrix (ECM) is damaged, and is unable to support healing[2]. Collagen is a natural substrate for cellular attachment, proliferation, and differentiation. When applied to the wound bed, it also promotes chemotaxis and modulates cellular responses[3]. Biofilm is a problem in over 90% of chronic wounds, and is responsible for both the breakdown of the chronic wound bed and the failure of many of our wound therapies[4]. Antimicrobial dressings have been shown to help reduce bacterial growth in the materials used and on wound limiting biofilm proliferation. Polymeric biomaterials have also been shown to aid in the healing process by interacting with the wound bed[5]. We present a case of a recurrent venous leg ulcer (VLU) that was resistant to compression and many advanced wound products. In this case study, we examine the long-term clinical effects of a combination therapy consisting of a silver impregnated, bioabsorbable, polymer matrix for wound bed stimulation and control of biofilm underneath an ovine collagen dermal template in the treatment of a recurrent venous leg ulcer. This combination has been successful when used with several cellular and acellular tissue-based products (CTPs), and thus, our aim was to study the effects using a dressing with a similar acellular structure.

Methodology

The patient was evaluated, and a complete history and physical examination were taken, including the history of the wound and previous dressings used. The patient has a medical history of chronic venous insufficiency, hepatitis C, asthma, degenerative disc disease, and kidney stones. A biopsy had been performed, and malignancy was ruled out as a contributing factor. Previous therapies had consisted of short stretch compression dressings with moist wound healing, antimicrobial foams, and the use of a placental CTP in a previous research study, but the wound recurred each time. At her initial office visit, we recorded her wound parameters, gently debrided the wound, and noted a biofilm adherent to the slough base. A polymeric silver contact layer was applied to stop the bleeding, reduce the pain, and reduce the bacterial proliferation on the wound. Intimate contact with the wound bed assured effectiveness of the silver applied. An ovine dermal template was moistened with saline and applied to the wound with a compression dressing using a foam for exudate control and periwound edema, while limb compression was provided by a 2-layer short stretch compression dressing. This was repeated weekly.

Results

Figure 1: VLU on Day 1 (2/7/20).

Figure 2: Treatment application on Day 1.

Figure 3: VLU on Day 17 (2/24/20).

Figure 4: VLU on Day 36 (3/2/20).

Table 1: Wound characteristics pre and post-treatment. N/A = non applicable

Treatment	Measurements (cm)	Area (cm)	% Area Reduction from Initial Treatment	Drainage	% Granulation	% Slough
Day 1 (2/7/20)	8.0 x 2.0	16.0	N/A	Moderate	60	10
Day 17 (2/24/20)	5.0 x 1.5	6.72	58	Mild	80	0
Day 36 (3/2/20)	3.5 x 0.8	2.8	97	Mild	90	0

Discussion

After 8 weeks of therapy, the treatment was cut short due to the COVID-19 pandemic. Many dressings do not maintain intimate contact with the wound bed, and are prone to tenting, sliding, or being destroyed by an excess of proteases on the wound. With this combination therapy, the percentage of area reduction from the day of initial treatment to day 36 of treatment was 97%, but more than 50% of the wound reduced in area after day 17 – nearly 2 weeks of treatment. In addition, the percentage of granulation and slough also both improved clinically. This demonstrates that using a polymeric matrix that adheres to the wound for intimate contact with the cells of the wound bed, followed by application of an ovine dermal template to stimulate angiogenesis and reduce metalloproteinases (MMP) concentrations on the wound can show significant clinical results, even for when treating a recurrent VLU.

Polymer dressings are excellent surface applicators prior to applying an acellular ovine CTP, and pose significant benefits for wound healing. The intimate contact of the polymer dressing to the wound bed reduces bleeding caused by debridement, and prevents biofilm formation on the surface for up to 3 days. Meanwhile, the CTP integrates into or "takes" to the wound bed. There is ease of application before or at the same time as the dry CTP dressing, making it a quick dressing to apply, and one that can easily be adapted to a home care setting with minimal training.

References

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