

# **Evolving Primary Dressings in Combination with Compression Therapy** Promotes Wound Healing in Complex Lower Extremity Ulcers of Mixed Etiology



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# **Abstract**

### Introduction

Lower extremity wounds present a complex challenge, often with several etiologies collaboratively delaying wound healing. Inflammatory symptoms of venous or lymphedema ulcers are commonly mistaken for infection, further delaying wound improvement. Multi-layer compression bandaging is an excellent treatment foundation to decongest edema and rapidly improves dependent wounds. However, wound progress under compression monotherapy can plateau. Compression bandaging quickly modifies the wound environment, and likewise, primary dressing recommendations must also be adjusted frequently. Here, we demonstrate the critical role of evolving primary dressings to enhance wound healing during the discrete stages of lower extremity wound advancement under multi-layer compression bandaging.

## Methods

Three patients presented with multimodal lower extremity wounds and dependent edema, existing for at least three months in the absence of compression. Compression therapy, bioburden management, and wound bed preparation were the mainstay of treatment throughout care. Primary dressing recommendations were modified from visit to visit, based on wound assessment and evolving needs. During early compression bandaging, drainage management was prioritized, e.g., with absorbent dressings or negative pressure wound therapy. Focus then shifted to optimize wound proliferation and epithelialization, e.g., with collagen and scaffolding wound matrices. After wound closure, skin hygiene and edema management were highlighted, e.g., with compression garments, donning devices, and moisturizers.

## Results

Here, we demonstrate that even in chronic wounds, dual therapy with multi-layer compression bandaging combined with evolving primary dressings promoted swift wound closure while managing edema.

# Discussion

Compression therapy provides a critical foundation for lower extremity wound care. We often observe delayed wound healing due to persistent mismanagement of these inflammatory, edematous wounds by neglecting edema management. Monotherapy with compression bandaging is often not sufficient to advance wound healing through completion. It is common for wounds in the lower extremities to have several contributing etiologies that require a fluid approach to primary dressing recommendations under compression. Identifying evolving wound needs and strategically pairing compression with appropriate primary dressings synergistically enhances wound healing and edema maintenance.

# **Wound Care Challenges**

Lower extremity wounds are often multi-factorial. Edema is a common denominator that contributes to chronic skin changes. Hemosiderin staining, the deposition of heme in the skin, leads to skin darkening or discoloration. This is often mistaken for cellulitis, and unsuccessfully treated with antibiotics. Unfortunately, hemosiderin staining in the absence of bacterial infection will not respond to antibiotics. Persistent edema causes inflammation, blistering, skin breakdown, and ulcers with heavy drainage. The drainage macerates and enlarges wounds. Compression is an effective therapy that can be combined with various primary dressings to both manage edema while treating additional wound contributors.

We have found success in a multimodal approach in these lower extremity wounds so that edema can be appropriately managed while addressing additional contributors. Common mixed etiologies at the lower extremity include arterial disease, trauma, retained hardware, surgical wounds, and chronic DVT. Less common but considerable mixed etiologies include pressure, infected hardware, bug bites, and malignancy.

# **Case Reports**

#### PATIENT 1

76-year old male patient

#### **SIGNIFICANT HISTORY:**

- S/p MVA 1968
  - Wheelchair bound
- S/p Hemorrhagic Stroke 2013
  - + Hemiplegia
  - +Spasticity
- Chronic recurrent LE DVT + IVC filter 2013
- Obese, BMI 37.88

# **WOUND HISTORY:**

76 y/o male patient with chronic recurrent BLE venous ulcers that wax and wane despite consistent compression. He has recurrent chronic DVT with IVC filter placed in 2013. The IVC filter has episodes of obstruction that lead to significant LE edema and heavily draining, inflammatory ulcers. Multi-layer compression is the mainstay of therapy. Antimicrobial primary dressings are initiated to target biofilm and hypercolonization. Absorption is optimized throughout treatment to manage heavy drainage with secondary superabsorbent, pliable dressings under compression. Periwound inflammation and moisture is managed using topical steroids and zinc barrier. Once the inflammation and drainage has improved, proliferation is encouraged with primary collagen and scaffolding dressings. Our team has resolved multiple episodes with the above approach. Between episodes of IVC filter obstruction when wounds are resolved and edema well managed, BLE compression is maintained.









Patient 1 Complicated 76 y/o male with chronic recurrent DVT in BLE, with permanent IVC filter placed 2013. Venous ulcers wax and wane 2/2 IVC filter obstruction. During flare ups, treatment is guided by wound presentation. Here, we apply multi-layer compression dressings at all visits. Primary dressings initially prioritize drainage, bioburden, and periwound inflammation and maceration. Once well managed, primary dressing focus shifts to proliferation using collagen and scaffolding matrices. Once wounds are closed, skin hygiene and protection is prioritized under long-term compression.

## PATIENT 2

77-year old male patient

## **SIGNIFICANT HISTORY:**

- Venous Insufficiency
- Lymphedema
- Obese, BMI 49.41
- Retained shrapnel under wound, not exposed
- Clinically diagnosed with chronic OM, placed on suppressive antibiotics, later discontinued
- Wheelchair bound, sedentary

**WOUND HISTORY:** 77 y/o male patient with chronic RLE wound starting in 2019. Our team began treating this patient in 04/2022 after wound worsening at outside facility, irregular shape 7x4x0.4cm. Edema decongestion and sharp debridement targeted throughout all care. Initially, a moist, antimicrobial primary dressing was applied to optimize a moist wound bed in minimally draining wound. Seen by vascular with appropriate arterial status. As wound improved, primary dressing shifted to proliferative collagen and scaffolding matrices, and serial human skin substitutes were placed with rapid improvement to 0.4x0.8x0.1cm, irregular shape as of 03/2024.

# **Case Reports**





04/18/2022

09/23/2022







05/15/2023

03/25/2024

Patient 2 77 y/o male with history of chronic wound 2018-2022, retained shrapnel beneath wound, not exposed. Treated for clinically diagnosed chronic OM with suppressive antibiotics that were later discontinued. Multi-layer compression dressings were applied throughout wound care, along with serial sharp debridement. Initially, the wound was minimally draining. To optimize moisture at the wound bed, a moist antimicrobial ointment was applied as the primary dressing. Later, collagen and scaffolding matrices were employed to promote proliferation and epithelialization. During episodes of stalling, human skin substitutes were applied to promote wound closure. Compression therapy in conjunction with various primary dressings have promoted wound healing in this wound that was progressively deteriorating prior to this approach.

## PATIENT 3

78-year old male patient

# **SIGNIFICANT HISTORY:**

- LE Hematoma s/p OR I&D + cellulitis
- Diabetes, A1C 7.0
- Obesity, BMI 38.52
- Chronic anticoagulation
- CKD3
- Vascular dementia

**WOUND HISTORY:** 78-year old male patient presented with LE hematoma + cellulitis, s/p OR I&D. Large undermining with small wound opening, minimal access. Compression and low frequency ultrasound applied throughout wound care. Initially, packing was applied, however recurrent hematoma formation prompted negative pressure application under compression which facilitated swift granulation. Collagen matrix later employed to promote closure.









Patient 3 78 y/o male patient with recurrent hematoma 2/2 anticoagulation changes, s/p OR I&D with small wound opening, subcutaneous communication, large undermining. Compression was applied throughout all wound care. Initially, packing to undermining from all wound openings employed, however this was insufficient to promote drainage and prevent hematoma reformation. Negative pressure applied with foam to all undermined areas which was successful to promote closure of the large open space. Compression continued over collagen matrices to promote final wound closure.

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