3M Sponsored Learning:

Management of Lower Extremity Wounds: Practices to Help the Wound Healing Journey

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Cindy Miller-Mikolajczyk has been a registered nurse since 1978. She has worked in various roles at KCI/3M for the past 22 years, including sales, clinical, marketing and research and development. She held the role of Senior Director of Clinical Science and Education at KCI's Corporate Headquarters and currently holds the role of Global Medical Translational Lead at 3M.

Vascular Wounds – Time is Tissue

Ischemic wound infection can rapidly progress to tissue loss. All lower extremity wounds should be considered to have concurrent peripheral arterial disease (PAD) unless demonstrated otherwise. PAD is a progressive disease that often requires revascularization surgery. Even then, surgery may have to be repeated for some patients. After revascularization surgery, there is a three-month "window of opportunity" for wound healing.

For vascular wounds:
Time is vascular patency
Time is extent of wound care requirements
Time is antibiotic requirement
Time is tissue

PAD can pose specific challenges for wound healing. On a cellular level, PAD can lead to impairment in:

- Collagen crosslinking (i.e., collagen scaffold rebuilding)
- Growth factor and cell availability
- Biofilm clearance
- Nutrient and oxygen availability
- Metabolic waste clearance (leading to altered pH, cell function and increased bioburden)

PAD can also hinder wound healing by:

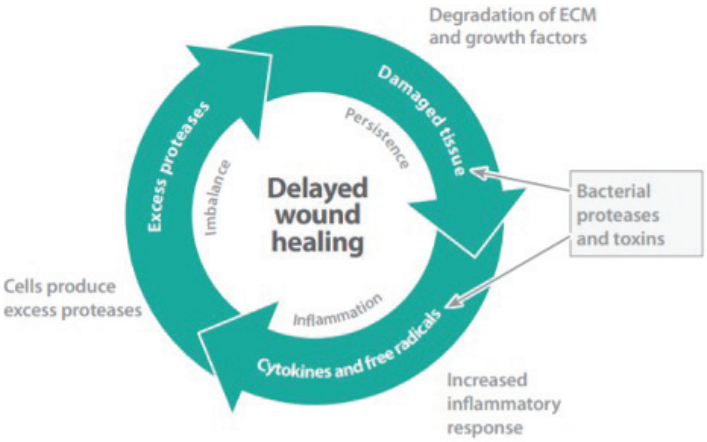
- Cultivating an environment favouring bacterial growth
- Neuropathy (i.e., altered sensation and cell function)
- The presence of edema

Patients with vascular wounds often have complex systemic diseases and comorbidities that can impact wound healing and their overall well-being. Even post-revascularization and when the wound progresses to closure, the tissue is often fragile and the wound can recur. Advanced therapies are a critical part of the toolkit for timely wound closure.

Non-Healing Wounds – Driving an Inflammation Cycle

Some vascular wounds can be trapped in a never-ending cycle of delayed wound healing (Figure 1). Non-healing wounds are often colonized by bacteria. These bacteria secrete proteases and toxins that can degrade the extracellular matrix and growth factors, leading

Figure 1. Cullen's Circle – The Vicious Circle of Delayed Wound Healing



Gibson D, Cullen B, Legerstee R, Harding K, Schultz G. MMPs made easy. Wounds Int. 2009;1:1–6.

to damaged tissues in the wound. Damaged tissues signal the body to initiate the inflammatory process, causing cytokines and free radicals to be released. Bacterial proteases and toxins can also cause the body to release cytokines and free radicals directly. This accentuates the inflammatory response. The ongoing inflammation causes cells in the wound to produce excess proteases, upsetting the balance between proteases and protease inhibitors. This causes further tissue damage and re-starts the cycle of none healing. Advanced wound therapies and products can be utilized to break free of this cycle of delayed wound healing.

Advanced Therapies: Part of the Complete Plan of Care for Vascular Wounds

Dressings:

Dressings are an important component of wound management. Dressings may aid in wound healing by:

- Maintaining pH and moisture balance
- Reducing inflammatory proteases
- Stimulating positive wound response by:
  - Supporting angiogenesis
  - Providing cellular components for collagen scaffolding, cell attachment, mitosis
  - Growth factor protection

Compression Therapy:

Compression therapy is the gold standard of care for venous leg ulcers (VLUs) in the presence of adequate arterial blood flow. They are also helpful for the management of post-operative edema (Table 1). When applying compression wraps, bulky underlying layers of gauze wraps and dressings can inhibit the comfort layer's ability to manage skin moisture and impact compression. Compression wraps should only be applied by trained clinicians to prevent negative outcomes. Inadequate compression may feel more comfortable for patients but can lead to sub-optimal wound outcomes (e.g., delayed healing).

Negative Pressure Wound Therapy:

Negative pressure wound therapy (NPWT), such as 3M™ V.A.C. ® Therapy, is a useful adjunctive therapy to support wound tissue building and healing. NPWT can aid wound healing by:

- Reducing edema
- Promoting perfusion and granulation tissue
- Drawing wound edges together
- Reducing wound size
- Providing an external barrier to contamination
- Enhancing epithelial migration
- Supporting structural integrity

NPWT with instillation incorporates soaks (most often saline) and dwell time. Instillation and dwell time are useful for facilitating the removal of thick wound exudate and other infectious material in the wound. 3M™ Veraflo™ Therapy is an example of NPWT with instillation and dwell. This therapy can be used with the 3M™ V.A.C. Veraflo Cleanse Choice™ Dressing, which may be considered as a wound cleansing option when surgical debridement must be delayed or is deemed inappropriate by the clinician.

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