

Diabetic Foot Wounds: Disease State Management and Advanced Treatment

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Introduction

Diabetic foot ulcers (DFUs) are a major health issue because they may be associated with amputations and high healthcare system expenditures.^{1,2}

DFUs are a consequence of many factors (eg, loss of protective sensation from peripheral neuropathy, arterial insufficiency). In addition to addressing surgical and systemic factors underlying DFUs, early intervention with appropriate advanced wound therapies is recommended to help promote granulation tissue formation and DFU closure.²

My purpose is to review fundamentals of good clinical wound care for treating DFU patients and to present cases demonstrating use of 3 advanced treatments: collagen/oxidized regenerated cellulose/silver (C/ORC/Silver*) dressings, negative pressure wound therapy (NPWT[†]), and epidermal skin grafts harvested with an epidermal harvesting system.[‡]

Holistic Care for DFUs

Wound healing can be improved by various treatments, but many factors need to be considered before proceeding with appropriate therapy selection.

Patient education, early assessment, and aggressive treatment by a multidisciplinary team represent the best approach to managing high-risk diabetic patients.

Examining the patient as a whole is important to evaluate and correct causes of tissue damage.

Wound healing is far more likely to be optimal in the setting of good diabetes management and ulcer care. Fundamentals of good clinical care include early assessment and treatment of patient comorbidities, infection management, appropriate offloading, and definitive diagnosis.

Optimal Therapeutic Approach

Presence of granulation tissue is critical to determining further changes in the therapeutic approach and the ability to close the wound by primary intention, skin graft, or bioengineered autologous/heterologous tissues.³

C/ORC/Silver dressings and NPWT are two topical wound management products that help manage the wound environment and have been reported to help promote the formation of granulation tissue in DFUs.

A new automated epidermal harvesting system is now available to harvest viable autologous epidermal micrografts with minimal to no donor site morbidity to cover superficial chronic wounds.

Optimized use of each of these technologies may positively affect closure of DFUs. Cases 1-3 demonstrate the use of each of these technologies for managing a DFU.

Conclusions

While some DFUs may be superficial and can heal with conservative treatment, many diabetic ulcers require advanced, modern wound technologies to progress to healing.

C/ORC/Silver dressings, NPWT, and epidermal grafts are viable advanced wound care modalities that may be considered for adjunctive management of DFUs.

Understanding mechanisms of these modalities and their role in the wound healing armamentarium can benefit wound care clinicians and patients in achieving definitive goals of wound healing.

References

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C/ORC/Silver Dressings for DFU Management

The efficacy of C/ORC/silver matrix dressings in managing DFUs is supported by an RCT.⁴ C/ORC/silver dressings can be used to manage DFUs that have shown little change in size or in appearance of wound bed or edges. These dressings are generally recommended for ulcers that have failed to proceed through an orderly reparative process towards healing.

Case Study 1. A 70-year-old male presented with a non-healing DFU with hypergranulation on the first submetatarsal head. Multiple treatments, debridements, and antibiotic therapy had been provided by other physicians but with no success.



A. DFU at presentation; after full-thickness, sharp excisional debridement, a C/ORC/silver matrix dressing and offloading were applied.
B. At 3 weeks post debridement and initiation of C/ORC/silver dressings, wound size was notably decreased.
C. At 7 weeks, DFU was nearly re-epithelialized.
D. At 3 months post treatment with C/ORC/silver dressings and offloading, the DFU was closed.

Use of NPWT in Treating DFUs

Based on a systematic review of 7 published RCTs on the effects of NPWT on DFUs, there is consistent evidence of the potential benefits of NPWT compared with control treatments.⁵ Numerous controlled studies have been published regarding the effects of NPWT on closure of amputation stumps and DFUs, reduction of secondary amputations, split-thickness graft take, overall cost, and quality of life for diabetic patients.

Case Study 2. A 42-year-old male presented with a necrotic third digit along with necrosis tracking proximal to the dorsum of the right foot and ankle.



A. Foot at presentation.
B. Postoperative foot following debridement and amputation of third digit. NPWT was applied for 20 days.
C. At 3 weeks postoperative, wound was granulating, but fourth toe was increasingly necrotic.
D. At 6 weeks postoperative, wound was nearly 100% granulated with decreased local edema.
E. At 12 weeks postoperative, patient returned to OR for amputation of fourth digit and split-thickness skin graft.
F. At one-year post initial surgery, the foot was fully recovered, plantigrade and functional.

Epidermal Skin Grafts to Treat DFUs

Epidermal skin grafts provide a viable option for DFU coverage that can be performed in an office or outpatient setting without anesthesia. Only the epidermal skin layer is removed at the donor site, resulting in minimal to no bleeding, minimal scarring, and little to no donor site pain. Heat and suction are applied concurrently to induce uniform, reproducible epidermal microdome formation and distribution.⁶ Preliminary evidence evaluating the use of epidermal skin grafts harvested with this new automated system over DFUs is promising.⁷

Case Study 3. A 65-year-old male with a history of peripheral vascular disease presented with a DFU on the dorsum right ankle that was caused by a complication from a previous surgery.



A. At presentation, silver nitrate was applied to the DFU to treat the hypergranulation tissue.
B. Epidermal grafts were harvested from the patient's right thigh.
C. Epidermal grafts were transferred using an adhesive film dressing.
D. Epidermal grafts were applied over the DFU, followed by a bolster dressing. After one week, the film dressing was removed.
E. Healed DFU at 3 weeks post-epidermal grafting.