**Introduction:**

Wound healing is a complex regenerative process to repair or replace injured tissue. The injury often involves some form of ischemia and when injured, the natural balance between cells in tissue is disrupted creating an altered wound environment.

Cells in the injured tissue immediately begin a process to regain their pre-injured state. This process is comprised of four distinct, timely and orderly phases: hemostasis, inflammation, proliferation, and maturation or remodeling. 1, 2

Chronic wounds have been defined as those that fail to progress through a normal, orderly and timely sequence of repair. 1 Those non-healing wounds become out of balance and stall at some point along the healing cascade. They continue to drain for weeks, months, or even years, and also by a resistance to treatment with conventional dressings. 3

Poor wound healing has been demonstrated in the patient with diabetes. Factors involved in wound healing that have been identified include: decreased collagen synthesis and deposition, decreased tensile strength, increased protease levels, reduced growth factor levels, compromised wound vascular status, and poor glycemic control. Poor wound healing can impart a particularly devastating financial burden on patients and diminished quality of life. Poor wound care is also frustrating to caregivers and clinicians attempting to provide wound management, as they often try to apply therapies beyond the number of the contribution to hospitalization for patients with diabetes. Complications associated with DFUs are the leading cause of non-traumatic lower extremity amputations. Despite quality nursing care and appropriate medical management these wounds often are resistant to the treatment plan resulting in poor wound healing, infection, and unstable closure. 3

Two diabetic patients with lower extremity non-healing wounds presented to our wound clinic. In our experience, wounds of similar etiology become refractory to a variety of therapies. For this reason we were willing to try a novel wound dressing* composed of a unique blend of cations found naturally in the body including potassium, zinc, calcium, and rubidium, in a mixture of chitosan, glycine and citric acid impregnated into an acetate cellulose cartridge. This dressing is designed to jump-start wounds, enabling the wound to progress through the normal healing cascade. 2, 4, 5

Initial application of the cation impregnated (CI) dressing was performed in the wound clinic. Patient 1 returned to the wound clinic twice a week for dressing changes. Patient 2, performed daily dressing changes at home, returning to clinic weekly. Patients had similar protocols of standard wound care including wound bed preparation, treatment of wound infections, sharp debridement, nutritional intake, pressure off-loading. Patient 2 also had compression therapy. Wound assessments were completed at baseline and at weekly intervals.

**Patient History**

A 48-year-old male presented with a 36-year history of Type 1 Diabetes. Other pertinent medical history included: neuropathy, hypertension, hyperlipidemia, CVA, and smoking. He was on multiple medications for the management of his diabetes, and other medical conditions. A modified transmetatarsal amputation and partial halluca amputation of the left foot was performed in 2000. Patient continued to smoke, experienced difficulty with foot wear and off loading and had marginal glycemic control. In 2008, an infection developed in the 5th metatarsophalangeal joint necessitating further surgery. He presented to the wound clinic four weeks after the onset of an ulcer at the MPJ. The wound culture was positive for Staphylococcus aureus and was treated with oral antibiotics. An X-Ray was negative for osteomyelitis.

**Patient 1**

A 65-year-old male patient presented with a history of Type 2 insulin dependent diabetes, hypertension, venous insufficiency, hyperlipidemia, and benign prostatic hypertrophy. He had a longstanding venous ulcer located on his left lateral ankle with initial onset in June 2005.

**Initial Wound Description and history of treatment:**

- Wagner Grades 2 (September 2005) and 5 (May 2008) for the left ulcer
- Ulcer present for four weeks prior to presentation to wound clinic
- Granular wound bed tissue with large hyperkeratic rim
- Large amount serosanguineous drainage
- Pseudomonas aeruginosa
- Sharp debridement
- Class III off-loading
- Hydrofiber as a daily dressing

Patient 1 was seen in our wound clinic twice a week. Prior to initiation of the CI dressing, a percutaneous tendon Achilles lengthening was performed. CI dressing was applied to a clean, sharp, debrided wound bed, with the dressing covered by a silicone gel barrier bandage. Patient used a Cam walker for offloading. CI dressing was changed twice a week in clinic.

**New Wound Management**

On November 26, 2008, a new treatment regime was initiated (Figure 1). The wound bed was minutely yellow and red granulating tissue, and a small amount of yellow drainage (Figure 1). CI dressing was applied over the clean wound bed, covered by a foam dressing. CI dressing was changed two times a week in clinic.**

There were no reports of adverse events, residue, or dressing adherence to the wound bed.

**Patient 2 Results:**

Marked improvement was noted within the first seven days of initial application (Figure 2), with continual progression towards closure (Figure 3). Wound closure with complete epithelialization was noted at day 49 (Figure 4).

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**Patient 1 Results:**

Marked improvement was noted within the first seven days of initial application (Figure 3) with continual progression towards closure (Figure 4) of 4.5 cm. Wound closure with complete epithelialization was noted at day 35 as shown in Figure 5.

There were no reports of adverse events, residue, or dressing adherence to the wound bed.

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**Conclusion**

These case studies highlight the results of two diabetic patients with full-thickness, non-healing chronic wounds that healed completely utilizing a CI dressing. Both patients had failed to heal with current therapy and were classified as chronic non-healing wounds with 100% epithelialization to the wound bed complete at day 35. There were no reports of adverse events, residue, or dressing adherence to the wound bed.

**References**