# Hydromechanical Debridement with Use of Negative Pressure Wound Therapy and Instillation to Assist Limb Salvage Misael C. Alonso, MD, FACP, CWSP, FAPWCA<sup>1,2</sup>; Justin Singh, DPM<sup>2,3</sup>; Deborah Key, RN, BSN, WCC<sup>2</sup> <sup>1</sup>MCA Medical, PLLC, Surprise, AZ; <sup>2</sup>Abrazo West Campus, Goodyear, AZ; <sup>3</sup>HealthyU Clinic, Avondale, AZ

## Background

- Tissue necrosis and infection stall wound healing and can lead to other complications, including disseminated infection and amputation.<sup>1</sup>
- For wound care patients at risk of lower limb amputation, rapid conversion from infected nonhealing wounds to healing wounds is essential in avoiding amputation.
- Use of negative pressure wound therapy with instillation and dwelling (NPWTi-d) of a topical wound solution assists in diluting, solubilizing and removing nonviable tissue in infected wounds,<sup>2,3</sup> which may help reverse a negative wound healing trajectory.

### Purpose

• We report our experience with NPWTi-d to adjunctively manage infected lower extremity ulcers of diabetic patients admitted under a limb preservation protocol.

> Case 1. 63-year-old male with history of PAD, venous insufficiency, hypertension, and uncontrolled DM type 2, with complications of neuropathy, vascular disease and prior DF ulcers. Presented with 5 infected right leg ulcers (anterior lower leg, proximal medial low leg, distal medial lower leg, proximal medial foot, lateral ankle) secondary to arterial and venous insufficiency and DM. Anterior and distal medial lower leg ulcers are shown below.

Anterior lower leg



A. Day 0. Eschar and slough coverage

Distal medial lower leg





B. Day 3. First dressing change





C. Day 24. Patient discharged with NPWT





D. Hydrocolloid

risk of leak



ROCF-CC foam dressing placed on right lower lateral leg

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NOTE: Specific indications, contraindications, warnings, precautions, and safety information exist for these products and therapies. Please consult a clinician and product instructions for use prior to application. Rx only.

## Methods

• Each wound was managed using a multidisciplinary team approach.

• NPWTi-d\* was applied with hypochlorous acid via a reticulated open-cell foam dressing with through holes<sup>†</sup> (ROCF-CC) in 9 complex lower extremity ulcers of 3 patients.

• Systemic antibiotics were administered, and sharp surgical debridement was performed prior to or in conjunction with NPWTi-d application.

• In addition to NPWTi-d, limb salvage protocol included diabetic control, offloading, revascularization, nutritional support and smoking cessation.

• NPWTi-d settings included instilling hypochlorous acid every 2 to 3.5 hours with a 10-20 minute dwell time between cycles of continuous negative pressure at -125 mmHg (**Table 1**); dressings were changed 3 times/week.

• At each dressing change, non-contact real-time fluorescence wound imaging was used to determine the presence and location of pathogenic bacteria, and non-contact near infrared spectroscopy studies were performed to measure deoxyhemoglobin, oxyhemoglobin, and ratio of tissue oxygenation.

• NPWTi-d was discontinued when patient was discharged and/or wound bed was covered with clean granulation tissue.

### **Dressing application**



applied on wound edges to minimize



E. ROCF-CC foam dressing placed on right lower medial leg



G. Foam placed contiguously to connect 6 wounds to 1 NPWTi-d unit

Case #	1	2	3
NPWTi-d settings			
Solution instilled	HOCI	HOCI	HOCI
Volume instilled initial	40	90	44
visit (mL)			
Dwell time (minutes)	20	10	10
NPWT time (hours)	2.5	2.0	2.5
NPWT pressure (mmHg)	125	125	125
Intensity	Medium	Medium	High
Outcomes			
<b>NPWTi-d duration</b>	3.4	6.3	6.6
(weeks)			
Time to closure (weeks)	Discharged with NPWT	11.7	13.0

Case 2. 73-year-old male with history of hypertension, dyslipidemia, PAD, chronic venous insufficiency, lymphedema and DM type 2 (uncontrolled) with complications of neuropathy and prior DF ulcers. Presented with chronic limb threatening ischemia of left leg with 3 infected arterial/venous ulcerations. Patient revascularized. NPWTi-d applied to all ulcers. Healing progression of left lateral calf ulcer shown below.





A. At presentation, arterialvenous ulcer measured 23.1 x 7.1 x 0.3cm (surface area: 67.5  $\rm Cm^2$ )



E. At 3 weeks, switched to NPWT plus collagen



F. Healthy wound edges at 6 weeks





G. At 10 weeks

### Table 1. NPWTi-d settings and outcomes results

### Results

- At presentation, wound size volume ranged from 4.6 to 49.2 cm<sup>3</sup>, and percent surface area coverage of nonviable tissue was between 15% and 100%.
- Wounds were converted to at least 90% coverage with clean granulating tissue in an average of 24.1 days during use of NPWTi-d.
- Amputation was avoided in all cases.

## Conclusions

- Limbs previously at risk of amputation were preserved following adjunctive use of NPWTi-d.
- NPWTi-d facilitated hydromechanical debridement as evidenced by removal of devitalized tissue through the ROCF-CC dressing.
- A clean granulating wound base allowed for successful application of cellular, acellular or matrix-like products (CAMPs).

### Cases



D. Healthy granulation tissue at first dressing change



I. Reepithelialized at 18 weeks

Case 3. 46-year-old female with history of hypertension, COPD, secondary lymphedema of venous etiology, severe morbid obesity, obstructive sleep apnea, uncontrolled DM type 2 and neuropathy presented with recurrent infected diabetic foot ulcer that had been present for 4-5 years. There was concern for progressive necrotizing soft tissue infection of left foot. Surgical debridement was performed to remove devitalized tissue, and NPWTi-d was initiated.





A. Left, plantar foot Wagner Grade 4 diabetic ulcers with abscesses and purulent fluid-filled blisters at presentation



D. After 3 days of NPWTi-d, granulation tissue buds forming. Patient discharged one week later with NPWT, collagen, HBO and CAMPs.



\*Solventum™ Veraflo™ Therapy; \*Solventum™ V.A.C. Veraflo Cleanse Choice™ Dressing, Solventum Corporation, Maplewood, MN The author thanks Solventum for assistance with poster preparation and production.

H. At 15 weeks



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Non-contact real-time fluorescence wound imaging. Red indicates Group B Streptococcus.



C. Skin/subcutaneous tissue level surgical debridement performed; 10 cm<sup>2</sup> area debrided. Wound measured 3.6 x 3.5 x 3.2cm post debridement. NPWTi-d initiated

E. After 4.5 weeks, wound area filled in. Periwound notably improved.



. Granulating wound with flattened edges at 10 weeks. Patient encouraged to offload



G. Reepithelializing wound at 13 weeks