Early Use of Negative Pressure Wound Therapy and Topical Solution Instillation in Complex Wounds of Patients with Vascular Disease: Case Study

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Background

- For patients with vascular disease, early disease recognition and access to appropriate and timely treatment of complex wounds is critical for limb salvage and reducing healthcare utilization.[1]

Purpose

- We report our experience with immediate application of negative pressure wound therapy (NPWT) with instilled saline and a novel foam dressing with through holes[2-4] in patients with compromised vascular integrity who presented with large complex wounds containing substantial areas of devitalized tissue and/or yellow fibrinous slough.

Methods

- Negative pressure wound therapy with instillation and dwelling (NPWTi-d*) of saline was applied via a reticulated open-cell foam dressing with through holes (ROCF-CC†) in three large complex wounds: a traumatic wound, an acute occlusion of the left distal superficial femoral artery secondary to a popliteal aneurysm, and a diabetic foot ulcer.
- Repeated sharp debridement was performed by nurses to aid in removal of devitalized tissue, and intravenous antibiotics were administered as appropriate.
- A pre-measured volume of topical normal saline was instilled every 3 hours with a 2-3 minute dwell time; dressings were changed 3 times/ week.
- Therapy was switched to traditional NPWT when the wound bed was covered with clean granulation tissue.

Results

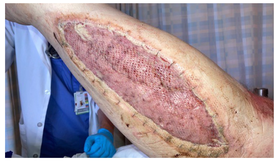
- Patient demographics and length of NPWTi-d are listed in **Table 1.**
- One patient had a history of vascular disease, one patient had undiagnosed peripheral vascular disease and one patient had diabetes.
- Average duration of NPWTi-d was 13.3 days.
- During use of NPWTi-d with ROCF-CC, thick exudate and slough were removed through the dressing.
- All wounds previously covered with devitalized tissue were converted to clean granulating wounds with subsequent closure and remodeling.
- Patient cases are shown in **Figures 1-3.**

Results (Cont'd)

Figure 1. A 52-year-old male sustained a traumatic injury to the left leg while falling off a ladder. Injury included transection of popliteal artery and popliteal vein, posterior left knee dislocation with transection of medial head of gastroc muscle, and tibial plateau fracture.

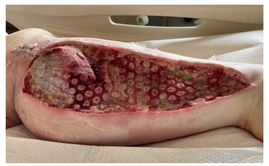
A. Left lateral leg at presentation. Wound was debrided of necrotic subcutaneous tissue and fascia, and NPWTi-d was initiated.

B. Left lateral leg following one week of NPWTi-d and regular surgical debridements and washouts.



C. Split-thickness skin graft (STSG) applied to lateral leg 31 days from initial injury.

D. Left medial leg wound at presentation. Wound was debrided of necrotic subcutaneous tissue and fascia, and NPWTi-d was initiated.

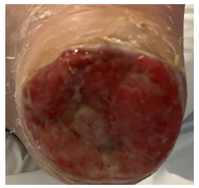


E. Left medial leg wound after 10 days of NPWTi-d and regular surgical debridements and washouts.

F. STSG applied to medial leg wound 31 days from initial injury. Number tags 1-3 indicate presence of granulation tissue.

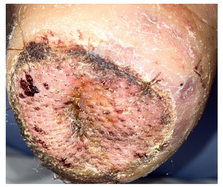
Figure 2. A 63-year-old male presented with a severe left heel diabetic ulcer plus tibial vessel disease.

A. Diabetic left foot ulcer at presentation. Systemic antibiotics were started.



B. 6 days post initial presentation after surgical debridement and angioplasty; NPWTi-d was initiated

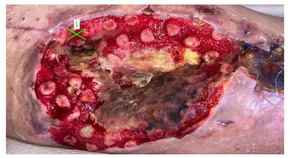
C. After 8 days of NPWTi-d, wound was beefy red and therapy switched to traditional NPWT



D. STSG applied 5 weeks after initial presentation

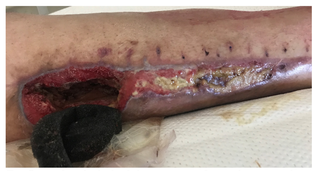
Figure 3. A 60-year-old male presented with critical leg ischemia secondary to a thrombosed popliteal artery aneurysm.

A. Following debridement of all necrotic muscle, NPWTi-d was initiated to assist with removal of slough and preparing the wound for primary closure.



B. Left medial leg wound after 8 days of NPWTi-d and foam dressing with through holes. Green "X" indicates undermining.

C. An antimicrobial hydrofiber dressing was applied along the incision line to protect periwound under NPWT drape. Green "X" indicates undermining.



D. Surgical debridement of eschar and NPWTi-d switched to traditional NPWT

E. Wound was primarily closed 12 days post presentation (Oval 1). Oval 2 marks area of previous hypergranulation tissue that is healing.

Table 1. Patient demographics, wound type, comorbidities and length of NPWTi-d.

Case #	Sex	Age	Wound type	Comorbidities	Duration of NPWTi-d (days)	Wound resolution
1	M	52	Traumatic injury to left leg, including transection of popliteal artery and popliteal vein; knee dislocation with transection of medial head of gastric muscle and tibial plateau fracture.	OSA not using CPAP, HTN, elevated BMI, urethral stricture	10	Well granulated wound; cellulitis resolved. STSG was applied 11 weeks after presentation. Discharged home with follow-up.
2	M	63	Severe left diabetic heel ulcer plus distal tibial disease	Type 1 diabetes on MDI, HTN, PVD, CKD, CAD, dyslipidemia, OSA	8	STSG applied 5 weeks after presentation and wound was healed at 9 weeks.
3	M	60	Critical leg ischemia secondary to a thrombosed popliteal aneurysm; surgical site infection	HTN, elevated BMI, CAD, anemia, ex-smoker	22	Well-granulated wound; cellulitis resolved. Closed by primary intention.

NPWTi-d = negative pressure wound therapy with instillation and dwell of a topical solution; OSA = obstructive sleep apnea; CPAP = continuous positive airway pressure; HTN=hypertension; BMI=body mass index; STSG= split-thickness skin graft; CAD=coronary artery disease; MDI=multiple daily doses of insulin; PVD=peripheral vascular disease; CKD=chronic kidney disease

References

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Conclusions

- **In these three complex wounds, adjunctive use of NPWTi-d with ROCF-CC facilitated detachment of slough and other infectious materials and promoted granulation tissue formation.**

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*3M™ Veraflo™ Therapy, †3M™ V.A.C. Veraflo Cleanse Choice™ Dressing (3M, St. Paul, MN)

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