Using Negative Pressure Wound Therapy With Instillation to Cleanse Lower Extremity Wounds: Assessing Potential Cost Savings

Ralph J. Napolitano, Jr., DPM, CWSP, FACFAS; OrthoNeuro, Columbus, OH

Background

- Use of negative pressure wound therapy (NPWT) with instillation and dwell time (NPWTi-d*) to deliver, dwell, and remove topical wound solutions from the wound bed can assist clinicians in preparing a clean surface for successful closure.
- By promoting wound healing, NPWT technologies have the potential to reduce the total treatment-associated costs over conventional therapies, despite having a higher unit price.[1-3]

Purpose

- We present our experience using NPWTi-d to manage lower extremity wounds in 3 patients and discuss the feasibility of improving cost efficiency.

Methods

- NPWTi-d using foam dressings with§ or without† through-holes was applied in the operating room (OR).
- Normal saline was instilled with an 8 to 10-minute dwell time, followed by 3-3.5 hours of -125 mmHg negative pressure.
- Therapy continued for 6-7 days with dressing changes every 2-3 days.

Results

- Patients were all male, aged 24, 51, and 83 years old.
- Wound etiologies included a chemical burn, deep tissue laceration, and compartment syndrome with soft tissue necrosis (**Figures 1-3**). All wounds were covered with non-viable tissue or fibrinogen, requiring cleansing.
- Prior to NPWTi-d, patients underwent surgical debridement and received antibiotics as necessary.
- After NPWTi-d, the wounds showed growth of healthy granulation tissue and reduced wound size.
- Patients were discharged and transitioned to standard NPWT‡ for 2-3 weeks before final closure.

Figures

Figure 1A. Presentation of potassium hydroxide burn after initial incision and drainage.

Figure 1B. Surgical debridement and application of NPWTi-d for 6 days.

Figure 1C. Wound appearance after transition to 3 weeks of conventional NPWT followed by epidermal micrografting.

Figure 1D. Fully closed wound at the 3-month follow-up.

Figure 2A. Initial presentation of deep tissue laceration of profoundly lymphedemic leg.

Figure 2B. Appearance after surgical debridement and partial closure.

Figure 2C. Granulating wound after 6 days of NPWTi-d.

Figure 2D. Fully closed wound at the 2-month follow-up.

Figure 3A. Initial presentation of compartment syndrome with soft tissue necrosis.

Figure 3B. Surgical debridement and application of NPWTi-d.

Figure 3C. Wound with macrocolumns after 3 days of NPWTi-d.

Figure 3D. Fully closed wound at the 5-month follow-up.

Results (Cont'd)

- Upon follow-up 2-6 months later, no patients experienced wound complications or required readmission to the OR, potentially saving on time and cost.
- Returns for OR debridement and each additional day spent in the hospital are estimated to cost $3,393 and $2,842, respectively.[2,4] A comparison of costs between each case's actual versus average hospital stay per wound type is shown in **Table 1**.

Table 1. Hospital stay comparison per wound type

Case	Injury Type	Actual Hospital Stay (Est. Cost)	Average Hospital Stay (Est. Cost)
1	Chemical burn	6 days ($17,052)	15 days[5] ($42,630)
2	Traumatic lower limb laceration	7 days ($19,894)	11 days[6] ($31,262)
3	Nonfracture compartment syndrome	6 days ($17,052)	13.5 days[7] ($38,367)

Conclusions

- In these patients, use of NPWTi-d assisted in cleansing the wound surface and producing a positive healing outcome.
- Despite higher initial costs of NPWTi-d over standard dressings, a wound management protocol including NPWTi-d may help mitigate expenses incurred by delayed healing.

References: 1. Deleyto A, Garcia-Ruano A, Gonzalez-Lopez JR. *Hernia*. 2018;22(2):311-318. 2. Gabriel A, Kahn K, Karmy-Jones R. *Eplasty*. 2014;14:e41. 3. Driver VR, Eckert KA, Carter MJ, French MA. *Wound Repair Regen*. 2016;24:6,1041-1058. 4. Health Forum, 1998-2018 AHA Annual Survey. In: AHA Hospital Statistics™. 2019. <https://www.kff.org/health-costs/state-indicator/expenses-per-inpatient-day-by-ownership>. 5. Barillo DJ, Cancio LC, Goodwin CW. Burns. 2004;30(5):448-52. 6. Singh P, Khatib M, Elfaki A, et al. *Ann R Coll Surg Engl*. 2017;99(8):637-640. 7. Lollo L, Grabinsky A. *Int J Crit Illn Inj Sci*. 2016;6(3):133-142.

Presented at Symposium on Advanced Wound Care Fall 2021, Las Vegas, NV, October 29-31, 2021

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.

The author thanks 3M for assistance with poster preparation.

*3M™ Veraflo™ Therapy; §3M™ V.A.C. Veraflo Cleanse Choice™ Dressing; †3M™ V.A.C. Veraflo™ Dressing; ‡3M™ V.A.C.® Therapy (3M; San Antonio, TX)