Effectiveness of Negative Pressure Wound Therapy with Instillation and Dwell in Removing Nonviable Tissue, Promoting Granulation Tissue, and Reducing Surgical Debridements: A Systematic Literature Review

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Introduction

- Debridement is an important technique in the treatment of complex wounds and is defined as the removal of any non-viable material or debris, such as necrotic tissue, slough, infectious material, biofilm, and foreign bodies from the wound bed to promote wound healing.[1-3]
- Surgical or sharp debridement is commonly used. However, there are often reasons why this may not be available or appropriate, such as the patient's poor general condition, the risk of excessive damage which can delay healing, risk of bleeding, or risks of anesthesia.[4]
- Negative pressure wound therapy with instillation and dwell (NPWTi-d) using reticulated open cell foam dressings with 1 cm x 0.8 cm holes (ROCF-CC) provides hydromechanical wound cleansing and promotion of granulation tissue formation (**Figure 1**).[5-8]

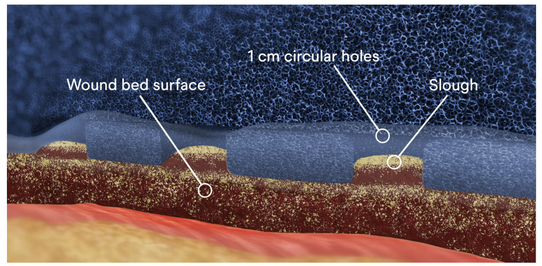

Figure 1. Negative Pressure Wound Therapy with Topical Wound Solution Instillation and Dwell (NPWTi-d) used in Conjunction with Reticulated Open Cell Foam with Through Holes (ROCF-CC). Used and reprinted with permission from Solventum.

Purpose

- This literature review examined the effectiveness of NPWTi-d with ROCF-CC in removing nonviable tissue and infectious material, promoting granulation tissue, and reducing surgical debridements.

Methods

- A systematic search of PubMed, Embase, and ClinicalTrials.gov was conducted to identify studies from January 1, 2015 –August 31, 2022.
- Included studies had outcomes related to nonviable tissue, granulation tissue, and debridement.
- Studies were summarized and analyzed using descriptive statistics.

Results

- 864 studies were identified from published literature and ClinicalTrials.gov (**Figure 2**). 87 studies met the criteria for a full text review and 21 studies met the inclusion criteria for the systematic review.
- A total of 178 wounds were treated with NPWTi-d with ROCF-CC in the included studies (**Table 1**).

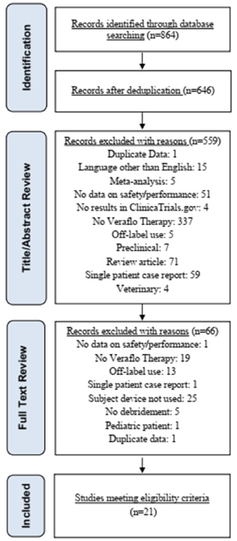

Figure 2. Results of the Literature Search

Table 1. Wound Types in the Included Studies

Wound Type	N (%)
Surgical/dehisced	78 (43.8)
Pressure ulcers/injuries	49 (27.5)
Traumatic	14 (7.9)
Diabetic foot ulcer	12 (6.7)
Chronic	10 (5.6)
Burn	7 (3.9)
Venous leg ulcer	4 (2.2)
Other/unknown	4 (2.2)
Total	**178 (100.0)**

Results (Cont'd)

- Evidence of reduction in necrotic and infected tissue following treatment was observed in 97.9% of wounds across 17 studies.
- Formation of granulation tissue after NPWTi-d with ROCF-CC was reported in 99.2% of wounds across 14 studies (**Table 2**.)

Table 2. Clinical Outcomes Associated with Use of NPWTi-d with ROCF

Clinical Outcomes	Studies with Reported Outcome (N=21)	Treatment Group Patients	Control Group Patients
Nonviable Tissue Outcomes			
Reduction in necrotic and infected tissue	17	142/145 (97.9%)	NR
Prevent development of nonviable tissue	1	9/9 (100%)	0/11 (0%)
Granulation Outcomes			
Granulation tissue formation	14	128/129 (99.2%)	NR
Debridement Outcomes			
Avoided surgical debridement	8	48/76 (63.1%)	0/11 (0%)
Significantly fewer surgical debridements, days (combined median)	2	1.5	3.0
Reduced wound surface area requiring debridement	1	4/7 (57.1%)	NR
Other Wound Outcomes			
Prepare wound bed for closure	7	33/40 (82.5%)	NR
Complete wound closure/healing	9	42/48 (87.5%)	2/5 (40.0%)
Shorter time to wound closure (days, combined mean, SD)	2	28.7 (37.9)	77.3 (102.3)
Reduction in wound size	2	2/10 (20%)	NR
Fewer days of therapy, days (median)	1	6	8
Shorter drain duration, days (median)	1	14	22
Wounds remaining healed at 90 days	1	15/15 (100%)	15/15 (100%)
Pain reduction	1	4/5 (80.0%)	NR
Decreased edema	1	15/15 (100%)	NR
Decreased erythema	1	15/15 (100%)	NR
Avoidance of amputation	2	5/7 (71.4%)*	NR

*Limited to patients where risk of amputation was noted.
NR = not reported

Table 3. Reported Complications and Adverse Events

Complications/Adverse Events	Number of Studies (N =21)	Treatment Group Patients N (%)	Control Group Patients N (%)
Seroma	1	0/15 (0)	3/15 (20.0)
Required at least one debridement to remove non-viable tissue following NPWT	1	0/9 (0)	11/11 (100.0)
Return to surgery for debridement	1	0/5 (0)	2/5 (40.0)
Continued infection	1	0/5 (0)	1/5 (20.0)
Toe amputation, TMA	1	0/5 (0)	1/5 (20.0)
Wound open for >2 years	1	0/5 (0)	1/5 (20.0)
Pain with dressing changes	4	11/35 (31.4)	N/A
Patient with diabetic ulcer experienced maceration of the peri-wound skin	1	1/4 (25.0)	N/A
No complications/adverse events reported	14	0/114 (0)	0/3 (0)

Results (Cont'd)

- Over 63% of patients avoided surgical debridements in 8 studies, and a statistically significant decrease in surgical debridements was noted in 2 comparative studies (**Table 2**).
- In each of the comparative studies, there were no reported adverse events in the treatment groups, while there were several complications reported in the control groups (**Table 3**).

Conclusions

- This systematic review offers supporting real-world evidence across a variety of complex wound types that NPWTi-d with ROCF-CC can provide hydromechanical removal of infectious materials, non-viable tissue, and wound debris.
- This leads to improved outcomes including the reduction of surgical debridements, and promotion of granulation tissue.
- NPWTi-d with ROCF-CC may eliminate the need for or reduce the frequency and extent of surgical debridement when required or provide an alternative treatment when the procedure is unavailable or not tolerated by the patient.

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*Solventum™ Veraflo™ Therapy with V.A.C. Veraflo Cleanse Choice™ Dressing (Solventum Corporation, Maplewood, MN)

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