

Combination of High-Voltage Electrical Stimulation* and Acoustic Pressure Wound Therapy** for Treatment of Pressure Ulcers: A Case Series

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Introduction

High-voltage electrical stimulation (HVES)* is recognized as an effective adjunct to standard care for expediting healing of chronic pressure ulcers.¹ Acoustic pressure wound therapy, a low-intensity/frequency ultrasound (LIFU)** has been shown to increase proportion of chronic wounds healed, promote faster wound volume reduction, and improve overall wound healing rates relative to conventional wound care alone.^{2,3} LIFU is administered to decrease microbial load in a colonized wound bed, decrease the inflammatory state, and promote granulation tissue in the wound bed.

Case Series

Three patients with Stage III pressure ulcers and substantial slough/eschar were treated with a combination of twice-weekly HVES (100 pps, ≈70-105 V based on patient tolerance, 40 min) and LIFU (5-6 min), with conservative sharp selective or enzymatic debridement as the wound bed indicated.

Conclusions

This combination of HVES and LIFU as adjuncts to conventional pressure ulcer care seems consistent with previous studies demonstrating faster granulation formation and promotion of a healthy wound bed with utilization of these individual modalities. Further evidence-based studies are warranted to evaluate this combination of wound healing modalities.

References

1. Kloth LO. "Electrical Stimulation for Wound Healing." In Kloth LO, McCulloch JM. *Wound Healing: Alternatives in Management*, Third Edition. Philadelphia: F.A. Davis Company, 2002, p 302-303.
2. Unger PG. Low-frequency, noncontact, nonthermal ultrasound therapy: a review of the literature. *Ostomy Wound Manage*. 2008;54(1):57-60.
3. Kavros SJ, Liedl DA, Boon AJ, Miller JL, Hobbs JA, Andrews KL. Expedited wound healing with noncontact, low-frequency ultrasound therapy in chronic wounds: a retrospective analysis. *Adv Skin Wound Care*. 2008;21(9):416-423.




Sacral Ulcer

Patient: 55-year-old paraplegic woman with type 2 diabetes

Wound: Sacral pressure ulcer with slough and deep tissue injury (DTI); > 6 months duration prior to treatment at our facility.

Dressings and Support: Hydrofiber and foam; high-profile wheelchair cushion.

Outcome: 95% granulation and 98% closure in 10.5 weeks (Jan. 18 –Mar. 31).

Jan. 18	Jan. 23	Mar. 10	Mar. 31
			(not pictured)
Twice weekly LIFU 5 min	Twice weekly LIFU 5 min	Twice weekly LIFU 6 min + HVES 40 min	Twice weekly LIFU 5 min + HVES 40 min
19.8 cm ²	6.3 cm ²	1.6 cm ²	0.32 cm ²
75% granular 15% slough 10% DTI	50% granular 50% slough	40% granular 60% slough	95% granular 5% slough





Left Heel Ulcer

Patient: 15-year-old male with no pertinent medical history

Wound: Unstageable pressure ulcer on left heel resulting from casting of a tibial fracture. Baseline (Apr. 30): area 12.3 cm², 5% slough, 95% eschar.

Dressings: Collagenase and gauze; changed to collagen with hydrofiber and foam Jun. 10.

Outcome: 98% granulation by 4.5 weeks (May 13 –Jun. 13); 97% closure at 11 weeks (May 13 – Jul. 30).

May 13	May 26	Jun. 13	Jul. 30
			
Twice weekly conservative sharp selective debridement and HVES 40 min; daily enzymatic debridement	LIFU 5 min added to existing regimen	LIFU 5 min with existing regimen; stopped enzymatic debridement	LIFU 5 min with existing regimen; stopped conservative sharp selective debridement 7/9
11.2 cm ²	10.5 cm ²	7.5 cm ²	0.32 cm ²
15% granular 35% slough 50% eschar	40% granular 60% slough	98% granular 2% slough	100% granular





Right Heel Ulcer

Patient: 38-year-old woman with a traumatic degloving injury of the left heel

Wound: Pressure ulcer on right heel developed after incision and drainage of degloving injury with loss of plantar fat pad on calcaneus. Baseline (Dec. 28): 5 cm², 60% slough, 40% granular.

Dressings: Gauze, collagenase, compression wrap; changed to hydrofiber and composites Jan. 23; changed to nonadherent petrolatum and gauze composite Feb. 20.

Outcome: 100% granulation in 2 weeks (Jan. 10–23); 95% closure in 8 weeks (Jan. 10 – Mar. 7); 99% epithelialized Mar. 12.

Jan. 10	Feb. 8	Feb. 20	Mar. 7
			
Twice weekly LIFU 5 min, HVES 40 min; debridement (weekly conservative sharp selective, daily enzymatic)	Twice weekly LIFU 5 min and HVES 40 min starting Jan. 23	Twice weekly LIFU 5 min	Twice weekly LIFU 5 min
3.8 cm ²	0.8 cm ²	0.32 cm ²	0.2 cm ²
50% granular 30% slough 20% fibrin	100% granular as of Jan. 23		

*Dy**Low-intensity/frequency ultrasound (MIST Therapy System, Celleration, Inc., Eden Prairie, Minnesota)
natron 950 Plus, Dynatronics, Salt Lake City, Utah
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