

Low-frequency therapeutic ultrasound rapidly healed challenging wounds

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Background

We have used low-frequency, noncontact ultrasound* on wounds of various etiologies for years. This case series shares some of our experiences using this technology.

Methods

We evaluated the clinical effectiveness of low-frequency ultrasound by assessing the rate of wound area and volume reduction, amount of drainage, wound bed composition, and wound-related pain. Four consenting patients with multiple medical problems and challenging wounds were selected for this case series. Patient #1 had multiple pressure ulcers and severe protein and calorie malnutrition. Patient #2 had a dehisced and infected 5th toe amputation, poorly controlled diabetes, and smoked throughout therapy. Patient #3 had an infected heel wound with exposed bone and dialysis-dependent diabetes with arterial insufficiency. Patient #4 had a fibrotic venous hypertensive wound, a history of venous wounds, and obesity. Patients received 17-33 low-frequency ultrasound treatments of 1-4 minutes each over 7-17 weeks, depending on wound size. Wounds were treated until closed.

Outcomes

Low-frequency therapeutic ultrasound appeared to decrease clinical signs of infection and drainage, stimulate wound bed granulation and epithelialization, and reduce or eliminate wound-related pain.

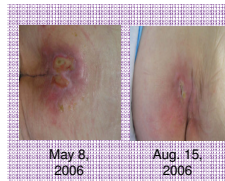
Conclusions

In these 4 cases, challenging wounds expected not to heal or to have prolonged healing rates healed faster than anticipated.

* MIST® Therapy, Celleration, Eden Prairie, MN

Patient #1: Multiple Pressure Ulcers

- 82-year-old Caucasian man; malnourished
- Several pressure ulcers (some deep, probing close to bone) developed during long hospitalization for pneumonia
- No pain with MIST Therapy, but pain with sharp debridement
- Concomitant therapies: sharp debridement, papain-urea ointment, collagen, silver, moist dressings, heel-relieving splint, pressure-relief mattress
- 33 MIST Therapy treatments: 8 lumbar spine, 17 heel, 6 right malleolus, 2 sacrum wounds
- All wounds closed in < 4 months despite malnutrition and lack of pressure-relieving cushion



Wound Location	Treatment Date	Wound dimensions, cm			Drainage	Tissue coloration, %			Pain 0-10	
		Length	Width	Depth		Red/Pink (granulation)	Yellow (slough)	Black (eschar)		
LEFT HEEL	5/8/06	2.9	1.9	0	Minimal	20	70	10	0	
	7/10/06	0	0	0	None	-	-	-	0	
RIGHT LATERAL MALLEOLUS	5/8/06	0.3	0.4	0.1	Minimal	0	100	0	0	
	6/26/06	0	0	0	None	-	-	-	0	
SACRUM: RIGHT, LEFT	5/8/06	R	2.8	0.9	0.1	Minimal	0	100	0	0
		L	3.1	1.8	0.2					
	6/22/06	R	0	0	0	None	-	-	-	0
		L	0	0	0					
LUMBAR SPINE	5/8/06	1.5	0.4	0.1	Minimal	0	100	0	0	
	6/2/06	0	0	0	None	-	-	-	0	

Patient #3: Diabetic Foot Ulcer

- 65-year-old Caucasian man with diabetes mellitus type II receiving kidney dialysis
- Medical history: coronary artery bypass graft and a recent lower extremity (LE) bypass
- Painful, bone-exposing, infected (*E. coli*, *M. Morganii*, *P. aeruginosa*) diabetic foot ulcer secondary to arterial insufficiency
- Treated with MIST plus debridement ointments, antibiotic solution, silver mesh dressings, and moist dressings
- Despite extreme wound-related pain, reported no pain with MIST Therapy
- 20 MIST treatments over 10 weeks: significant healing despite exposed bone, infection, multiple comorbidities, and reluctance to eliminate weight-bearing at wound site



Treatment Date	Wound dimensions, cm			Drainage	Tissue coloration, %			Pain (0-10)
	Length	Width	Depth		Red/Pink (granulation)	Yellow (slough)	Black (eschar)	
6/14/06	4.3	4.0	1.5	Minimal	10	40	50	10
9/25/06	2.6	1.5	0.5	Minimal	70	30	0	0

Patient #2: Dehisced, Infected 5th Toe Amputation

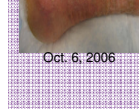
- 56-year-old Caucasian man; diabetes mellitus type II; smoked cigarettes
- Amputation of left 5th toe due to osteomyelitis from injury in boating accident
- Presented 1 month post surgery after incision/drainage procedure
- MIST Therapy every 3 to 4 days (outpatient) after wound became infected and dehisced
- Concomitant therapies: polyvinyl alcohol sponge with methylene blue and gentian violet; bovine collagen; pneumatic walking boot (noncompliant)
- 2 days of MIST treatment: granulation tissue markedly increased
- After 1 month of MIST, wound epithelialized in center leaving 2 smaller wounds that were 90% granular
- Wounds closed in 2 months after 17 MIST treatments despite limiting factors of smoking, infection, and low albumin



Treatment Date	Wound dimensions, cm			Drainage	Tissue coloration, %			Pain (0-10)
	Length	Width	Depth		Red/Pink (granulation)	Yellow (slough)	Black (eschar)	
9/15/06	5.4	1.7	1.0	moderate	50	50	0	0
10/20/06	1.2	0.5	0.3	Minimal	90	10	0	0
	0.4	0.2	0.4					
11/13/06	0	0	0	None	-	-	-	0

Patient #4: Right Medial LE Ulcer

- 59-year-old Caucasian man; diabetes mellitus type II, deep vein thrombosis, degenerative joint disease, obesity, venous hypertension, and recalcitrant wounds
- June 2006: venous hypertensive ulcer on right medial LE did not respond to home care with debridement ointment and silver dressings
- July 30, 2006: 80% slough, 20% granulated
- MIST Therapy twice weekly with moist dressings and compression wraps
- No pain with MIST, but sharp debridement painful, even with 4% lidocaine-soaked gauze pre procedure
- Very fibrotic wound quickly granulated and re-epithelialized after initiating MIST
- Wound closed with 20 MIST treatments over 2 months
- Subsequently radio wave frequency ablation for improved venous return and wound prevention



Treatment Date	Wound dimensions, cm			Drainage	Tissue coloration, %			Pain (0-10)
	Length	Width	Depth		Red/Pink (granulation)	Yellow (slough)	Black (eschar)	
7/30/06	3.0	2.2	0.5	Minimal	20	80	0	3
10/6/06	0	0	0	None	-	-	-	0

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