

Low-Frequency Ultrasound Therapy in the Management of Severe Burn Wounds



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Introduction:

Low-frequency ultrasound therapy (in the range of 30-100kHz) has been known to have various positive effects in tissue restoration and wound healing. The therapeutic effects of ultrasound on wounds are mainly two-fold:

(1). Cavitation effect:

- Fibrinolytic separation of denatured protein.
- Selective debridement & fragmentation of non-viable tissue.
- Direct killing of surface bacteria and biofilms.

(2). Stimulatory effect:

- "Fluid shear stress" generated on the wound surface →
- Nitric oxide within the endothelium for vasodilatation resulting in increased blood flow.
- Stimulation of fibroblasts, macrophages and endothelial cells to augment healing.

The Quostic wound therapy system is the latest low-frequency ultrasound system (35kHz) that combines the sharp "curettling" debridement with continuous saline irrigation, while delivering focused therapeutic ultrasound therapy to the wound bed.



Case Presentations:

- Third degree burns are defined by the loss of full-thickness skin, with the formation of pseudo-eschar (yellow-to-white rubbery necrotic tissue).
- The surgical debridement of these pseudo-eschars may be tedious, as the separation of non-viable tissue from underlying viable subcutaneous tissue is often not apparent.
- Low-frequency ultrasound therapy has been advocated as an adjunct to surgical debridement because the mechanical (vibratory) energy of ultrasound therapy on soft tissue aids the separation of viable and non-viable tissue.

Conclusion:

- The ultrasound debridement device is a useful tool in the management of severe burn wounds.
- The debridement property of the ultrasound facilitates the elimination of pseudo-eschar with minimal loss of viable tissue, resulting in the optimal wound healing by second intention, without the need for hospitalization and/or skin graft.

Case 1.

58yo DM neuropathic male, 3rd degree burn wound on right foot from a microwavable heating pad applied overnight.



Initial Presentation:

- Large and deep burn wound, debrided, irrigated and treated with ultrasound.
- Most of eschar tissue removed on this initial visit.



Week 2 through 11:

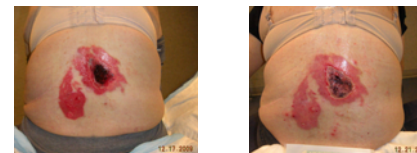
- Continue once to twice weekly visits with ultrasound debridement.
- Extensor tendons partially exposed initially.
- Wound VAC therapy + Skin graft was offered, but deferred by the patient.
- Dressings: foam dressing and compressive bandage for edema reduction.



Week 12: Complete wound closure achieved.

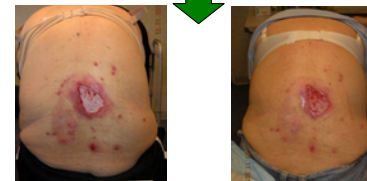
Case 2.

79yo female with chronic lower back pain, sustained 3rd degree burn on lower back by sleeping with a heating pad overnight.



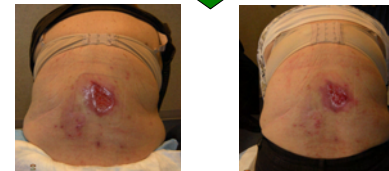
Initial Presentation:

- Painful burn wound with central necrosis with hard and adherent eschar.
- The wound was debrided, irrigated and treated with ultrasound.
- Dressing: foam dressing with paper tape, changed twice per week.



Week 2 through 6:

- Eschar successfully eliminated with sharp debridement and ultrasound therapy.
- Minor skin cellulitis was treated with culture-directed Doxycycline.



Week 6 through 9:

- Once to twice weekly visits with ultrasound debridement.
- Wound pain decreased substantially, decrease in wound depth & size.
- Oasis Skin Substitute was used to facilitate the epithelialization.



Week 10: Complete wound closure achieved.

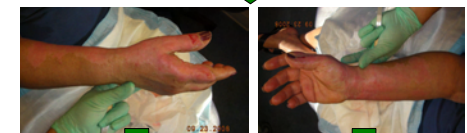
Case 3.

56yo female, Right hand & wrist 3rd degree burn from spilled hot cooking oil in the kitchen.



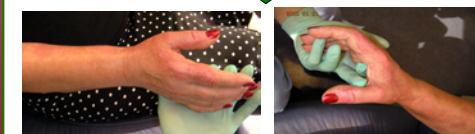
Initial Presentation:

- Serous blisters de-roofed.
- The entire wound was debrided, irrigated and treated with ultrasound.
- Dressing: Xeroform, gauze and compressive bandage applied.



Week 2 and 3 follow up visit:

- Clinically much improved with less pain.
- Visible signs of epithelialization with no sign of infection.
- Painful deep burn wound on the thumb remains.
→ Dressed with foam dressing with compression.



Week 4:

- Complete wound closure achieved with minimal scarring.
- Patient educated on sun screen protection and emollients.