

Effects of Noncontact Mist Ultrasound Therapy (MUST™) on Bacterial Levels in a Chronic Wound Bed

Teresa Conner-Kerr, PhD, CWS, D and P. Sullivan, PhD, MT (ASCP),
East Carolina University, Greenville, NC;

Angie Sanders, PT, Karen Poole, PT, and Sherry Rowe, PT, Caswell Center, Kinston, NC

Abstract: Infection is known to be a risk factor for developing a non-healing chronic wound. Treatment options for these localized infections are limited. As a result, systemic antibiotics are often employed and this practice is thought to contribute to the increased development of antibiotic resistant pathogens. The purpose of the present study was to determine if a novel localized treatment using non-contact ultrasound technology, Mist Ultra-Sound Transport (MUST™) Therapy, is effective in reducing microbial numbers in a chronic wound. An individual with profound mental retardation, spina bifida and a sacral wound of greater than 26 years duration as treated with MUST™ due to a recurrent infection with *Pseudomonas aeruginosa* (PA). Initial swab cultures of the wound bed center and the 6 o'clock position revealed the presence of 90 and 1200 PA colony forming units (CFUs), respectively. After two treatment sessions with MUST™, PA CFUs decreased to 3 at the wound center and 300 at the 6 o'clock position. No PA CFUs were detected at the wound center and only 6 PA CFUs were found at the 6 o'clock position after the third treatment session. These results indicate that MUST™ is effective in reducing bacterial numbers in chronic wounds.

Introduction: Ultrasound has been used by physical therapists to manage tissue injury for decades. Ultrasound is defined as a mechanical pressure wave that is transmitted at frequencies above 20 Kilohertz (kHz)¹. Traditional ultrasound therapies used by physical therapists have included both 1 and 3 Megahertz (MHz) frequency generators. Using traditional MHz ultrasound, Dyson et al. has demonstrated in a controlled clinical trial that venous insufficiency wounds exhibit a statistically significant reduction in wound size compared to sham treated controls². Additionally, a controlled clinical trial by McDiarmid et al. found that MHz ultrasound improved the rate of healing in infected pressure wounds³. MHz ultrasound has also been shown to stimulate wound contraction, angiogenesis, and collagen deposition as well as to improve wound breaking strength and collagen organization in the wound bed^{4,5,6,7}. Studies at the cellular level indicate that MHz ultrasound stimulates fibroblast migration and proliferation as well as increases endothelial cell proliferation⁴.

However, relatively little research has focused on the effects of kHz or long-wave ultrasound on the wound healing process in the Western World. In the former Soviet Union, kHz ultrasound has been used successfully to promote wound healing. In this study, the effects of kHz ultrasound on wound debridement and bacterial levels were examined. This application uses a novel technology to transmit ultrasound through a mist to the wound bed. This technology differs from traditional ultrasound in that it employs kHz frequencies and is delivered.

Purpose: To determine the effectiveness of MUST™ in reducing bacterial numbers in a chronic wound.

Method:

- Wound Cleansed Daily
- Baseline Swab Culture Collected
- MUST™
- Swab Cultures Collected Post-MUST™ Daily
- Wound Dressed with Panafil and Sterile Gauze
- Colony Counts and Identification of Bacteria

Results:*Colony Counts*

Wound Location	Day 0	Day 2	Day 3
Center	90	3	0
6 o'clock	1200	300	6

Colony Counts

Wound Location	Day 0	Day 2	Day 3
Center	44/56	3/0	1/0
6 o'clock	400/0	100/0	4/0

(Staphylococcus/Streptococcus sp. Colony Counts Derived from Swab Cultures of Human Chronic Wound Bed Treated with MUST™.)

Effects:

- Decreased Wound Odor
- Elimination of Purulent Exudate
- Decreased Slough
- Increased Granulation Tissue

Summary:

- MUST™ appears to be effective in reducing bacterial numbers
- MUST™ appears to stimulate debridement
- MUST™ appears to induce granulation tissue formation

Presented at SAWC 2001