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| **Author, Journal, Year, Title** | **Purpose** | **Condition** | **Study Design** | **N** | **Results, p≤.05** | **Clinical Relevance** |
| Bell AL, Cavorsi J, *Phys Ther* 2008. Noncontact Ultrasound Therapy for Adjunctive Treatment of Nonhealing Wounds: Retrospective Analysis | To assess the impact of NCUT on healing for wounds that fail to progress with conventional care alone | Non-healing wounds of various etiologies; most were on the lower extremities and due to venous insufficiency, pressure, surgery, and trauma | Case series  | 76 | After NCUT: mean wound area reduction of 79%; 46% of wounds had >75% healthy granulation tissue; periwound skin rated as normal increased to 75%; 73% of wounds had scant or no drainage; small reduction in pain | Significant wound size reduction in median time of 4.3 weeks. Mean duration of NCUT was 5.1 minutes for a mean frequency of 2.3 times per week. Wounds had increased amounts of healthy granulation tissue and reduced amounts of exudate and fibrin slough. |
| Ennis WJ, Valdes W, Gainer M, Meneses P, *Adv Skin Wound Care* 2006. Evaluation of Clinical Effectiveness of MIST Ultrasound Therapy for the Healing of Chronic Wounds | To evaluate the performance of MIST therapy on healing outcomes in an actual wound clinic setting | Wounds of multiple etiologies, including venous and ischemic, diabetic ulcers, pressure, postoperative, and inflammatory, that present to an outpatient wound clinic | Cross- Sectional | 145 | After MIST therapy: overall healing rate was 69%, despite the loss of 7 patients lost to follow-up, death, or amputation. Removing these cases resulted in a 91% healing rate. | The overall healing rate of 69% was achieved during a maximum treatment time of 27 weeks and a mean treatment time of 13 weeks. With MIST therapy, wound healing should be evident within the first 4 weeks. |
| Herberger K, Franzke N, Blome C, Kirsten N, Augustin M, *Dermatology* 2011. Efficacy, tolerability and patient benefit of ultrasound-assisted wound treatment versus surgical debridement: A randomized clinical study | To compare the efficacy, tolerability, and benefit of surgical debridement and ultrasound-assisted wound treatment. | Chronic leg ulcers of vascular origin | RCT | 67 | Ultrasound and debridement showed comparable positive effects on wound status, patient benefit, and quality of life. Tolerability and efficacy were perceived almost equally by physicians and patients. Pain levels induced by the procedures were also equivalent. | For effective wound treatment, ultrasound can be used instead of surgical debridement , which will save time and money. Ultrasound can be performed in an outpatient setting and can be performed by PT’s rather than surgeons. |
| Kavros SJ, Liedl DA, Boon AJ, Miller JL, Hobbs JA, Andrews KL, *Adv Wound Care* 2008. Expedited wound healing with noncontact, low-frequency ultrasound therapy in chronic wounds: A retrospective analysis. | To assess wound healing with MIST therapy | Lower extremity wounds | Case-control | 210 | Of the 163 wounds in the MIST therapy group, 53% healed over a mean of 147 days. Of the 47 wounds in the control group, 32% healed over a mean of 134 days. The MIST therapy group experienced a faster rate of healing (slope of regression line=1.4) when compared to the control group (slope=0.22). Rates of healing in ischemic, neuropathic, and venous wounds were greater for MIST therapy than for wounds treated with standard care.  | There was a pattern of proportionately more wounds healed with MIST therapy than without, but the difference was only significant for wounds of venous origin. Analysis of percent closure showed a similar pattern of benefit associated with MIST therapy. Again, the benefit is statistically significant for all wounds and for venous wounds, but is a nonsignificant trend for ischemic and neuropathic wounds. It is important to note that many patients with ischemic wounds had not yet been treated to alleviate their ischemia at the time of this study. The percent reduction in mean wound volume was greater in wounds treated with MIST therapy. This was observed for all wounds and wounds of ischemic and venous etiology. Wounds of neuropathic etiology showed greater mean volume reduction in the control group. |
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| Luedtke-Hoffmann KA, Schafer DS, *Phys Ther* 2000. Pulsed lavage in wound cleansing. | To assess the research examining the effects of pulsed lavage in wound cleansing  | Wounds of various etiologies | Systematic Review | 52 articles | Pressures between 5 and 10 psi most effectively remove surface debris, such as loose necrotic tissue and wound exudate. Irrigation pressures above 10 psi protect the wound from gross infections. There is no evidence of bacteremia following lavage applications, regardless of pressure. | The results from this review provide further evidence for the clinical guideline established by the AHCPR of 4-15 psi. Pulse lavage was found to be more effective than whirlpool in promoting healing. This is a safe modality and can be administered bedside.  |
| Ho CH, Johnson T, Miklacic J, Donskey CJ, *Arch Phys Med Rehabil* 2009. Is the use of low-pressure pulsatile lavage for pressure ulcer management associated with environmental contamination with acinetobacter baumannii? | To determine the extent of environmental contamination associated with low-pressure pulsatile lavage when routine infection control precautions are used as compared with standard dressing changes | Stage III and IV pressure ulcers colonized or infected with Acinetobacter baumannii in patients with SCI | Cross-Sectional | 15 | Of the 15 patients, 9 grew A. baumannii from their wounds. Of those 9, only 1 had environmental contamination after pulsatile lavage AND standard dressing change. (Results not reported in terms of statistical significance). | Low pressure pulsatile lavage is not associated with an increased rate of A. baumannii in comparison with standard dressing changes when a standard infection control protocol is utilized: replacement of disposable suction canister inserts after each procedure, appropriate use of a splash shield to contain splashes, maintenance of close proximity of the suction tip with the wound bed during the procedure, having health care workers who perform low-pressure pulsatile lavage use personal protective equipment (ie, gowns, gloves, surgical masks, goggles), covering intravenous lines and wounds, restriction of pulsatile lavage to private rooms with easily washable surfaces and no open supply shelves, and adequate training of staff regarding infection control measures. In addition, these measures should be taken when performing dressing changes as well to prevent possible contamination. These measures should also be employed during standard dressing changes to minimize risk of contamination. |
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| Ho C, H., Bensitel T, Wang X, Bogie K, M, *Phys Ther* 2012. Pulsatile lavage for the enhancement of pressure ulcer healing: A randomized controlled trial. | To investigate the efficacy of low-pressure pulsatile lavage | Stage III and IV pressure ulcers in patients with SCI | RCT | 28 | Pulsatile lavage group’s final wounds were 54% of the size they were at baseline, whereas the control group’s final wounds were still 77% the size that they were at baseline. | Administration of pulsatile lavage was well tolerated. Healing rate, indicated by wound size and volume, was achieved faster in wounds treated with pulsatile lavage and standard wound care than in those treated with standard wound care alone. Pulsatile lavage can be administered bedside, has a disposable tip, is low-cost, and this study proves its efficacy for use in pressure ulcers, one of the common complications associated with long-term inpatient stay, spinal cord injury, etc.   |
| Shetty R, Barreto E, Paul KM, *Int Wound J* 2012. Suction assisted pulse lavage: randomised controlled studies comparing its efficacy with conventional dressings in healing of chronic wounds | To evaluate pulse lavage therapy’s ability to improve the healing rate of chronic wounds compared to that of the traditional saline-wet-to-dry dressings | Chronic wounds | RCT | 30 | Wounds treated with pulsatile lavage had a 14.88% decrease in wound size while the control group only had a 7.23% decrease in wound size. The pulsatile lavage group had significant reduction in bacterial contamination 3 days after treatment. After 3 days of treatment, 46.67% of the patients in the pulse lavage group had no pain and 53.33% had mild pain. In comparison, nearly 80% of the patients in the control group continued to have some discomforting pain. The duration of treatment for the pulsatile lavage group lasted from 5 to 9 days (mean 6 ± 1.8 days). Nearly 50% of wounds healed by sixth day, and almost all wounds healed by 7–8 days. For the control group, the duration of treatment lasted from 9 to 18 days (mean 14.2 ± 2.8 days). Healing required nearly 14 days for majority of wounds to heal. The total length of hospitalization was also significantly increased in the conventional group. | The researchers made sure the nozzle maintained total circumferential contact with the wound surface to ensure concurrent negative pressure. Wounds treated with pulsatile lavage achieved healing or were grafted sooner. |

1. Bell AL, Cavorsi J. Noncontact ultrasound therapy for adjunctive treatment of nonhealing wounds: Retrospective analysis. Phys Ther. 2008;88(12):1517-1524. doi: 10.2522/ptj.20080009.

2. Ennis WJ, Valdes W, Gainer M, Meneses P. Evaluation of clinical effectiveness of MIST ultrasound therapy for the healing of chronic wounds. Adv Skin Wound Care. 2006;19(8):437-446.

3. Herberger K, Franzke N, Blome C, Kirsten N, Augustin M. Efficacy, tolerability and patient benefit of ultrasound-assisted wound treatment versus surgical debridement: A randomized clinical study. Dermatology. 2011;222(3):244-249. doi: 10.1159/000326116.

4. 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. doi: 10.1097/01.ASW.0000323546.04734.31.

5. Luedtke-Hoffmann KA, Schafer DS. Pulsed lavage in wound cleansing. Phys Ther. 2000;80(3):292-300.

6. Ho CH, Johnson T, Miklacic J, Donskey CJ. Is the use of low-pressure pulsatile lavage for pressure ulcer management associated with environmental contamination with acinetobacter baumannii? Arch Phys Med Rehabil. 2009;90(10):1723-1726. doi: 10.1016/j.apmr.2009.04.009.

7. Ho C, H., Bensitel T, Wang X, Bogie K, M. Pulsatile lavage for the enhancement of pressure ulcer healing: A randomized controlled trial. Phys Ther. 2012;92(1):38-48. https://auth-lib-unc-edu.libproxy.lib.unc.edu/ezproxy\_auth.php?url=http://search.ebscohost.com.libproxy.lib.unc.edu/login.aspx?direct=true&db=c8h&AN=2011432636&site=ehost-live&scope=site. doi: 10.2522/ptj.20100349.

8. Shetty R, Barreto E, Paul KM. Suction assisted pulse lavage: Randomised controlled studies comparing its efficacy with conventional dressings in healing of chronic wounds. Int Wound J. 2012. doi: 10.1111/j.1742-481X.2012.01062.x; 10.1111/j.1742-481X.2012.01062.x.