

Wound Management with Physical Modalities in Sports Medicine

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Introduction

An often overlooked area of beneficial treatment in sports injuries is open wounds. With the increase in the overall prevalence of such infectious disease, methicillin-resistant *Staphylococcus aureus* (MRSA), as well as indications for improvement and access to treatment options, clinicians should consider the use of physical modalities [1]. Physical modalities are common devices in the sports medicine clinic, and although their uses are more well known in other areas of treatment, there is evidence in using such methods in accelerating wound healing in physical activity related injuries [2,3]. In a review by Foster et al. (1995) it was noted that despite the information on wound healing, superficial, there is little notation in certain parameters, to include frequency [4]. There continues to be an absence of literature on the specific parameters for common wounds in physical activity injury. Therefore it is important that this information be accessible to clinicians and the value of open sourced journals should not be underestimated. The purpose of this brief review is to provide an outline of commonly used modalities in sports medicine clinic as component wound management of physical activity related injuries or others common to the population.

Common types of skin wounds in physical activity injuries include abrasions, blisters, lacerations, post surgical incisions, and scar formation as well as the presence of infection [1,5]. Though there will be brief discussion on the anti-infection nature of certain modalities, the protocols provided will be focused on the healing of superficial wounds. There are multiple opportunities to enhance the healing process, via minimizing excessive inflammatory response, improving proliferation, improving maturation and remodeling by increasing tensile strength and minimizing scar formation, and reducing secondary injury response or infection. By decreasing the time necessary for complete resolution of an injury, if possible, could also be considered important in reducing detraining of an active person and improving return to activity.

Electrotherapy

The more commonly used modes in wound manage for devices commonly found in outpatient clinics are high volt pulsed current and microcurrent. High volt pulsed current (HVPC) uses a monophasic, double spiked, high volt current of 150-500 volt, where as microcurrent has an amplitude of less than 1 milliamp. High volt is used to enhance the electrical healing component of tissue, while also providing certain other mechanisms associated with higher dose electrical therapy such as edema and pain reduction, but minimizing the effects, e.g. nociception via a short phase duration in the current. Microcurrent is thought to mimic the electrical nature of the tissue and to enhance those with an appropriate level of current to heal properly, typically chronic wounds. There can be benefits in using both the anode and cathode over areas of treatment in healing during specific phases, and both have been shown

Condition	Amplitude (Patient Tolerance)	Mode	Electrode Polarity	Treatment Duration**	tx Frequency
Acute	<1 mA	Pulsed, 100 pps	Anodal	30 min	1-4x/daily
Subacute	<1 mA	Continuous	Cathodal*	30-120 min	1x/daily

Table 1: Treatment Parameters for Micorcurrent.

Condition	Amplitude*** (Patient Tolerance)	Mode (Pulsed)	Electrode Polarity	Treatment Duration**	Tx Frequency
Acute	150-250 V	>100 pps	Anodal	30 min	1x/daily
Subacute	150-250 V	>100 pps	Cathodal*	30-90 min	1x/daily

*Can use reversal, and may be indicated if suspect infection and/or unable to determine exact phase of injury

**Has been shown to require a min of 30 min to be germicidal

***Maximal germicidal effect was shown to be 2 hours at 250 volts

Table 2: Treatment Parameters for High Volt Pulsed Current.

Condition	Power	Mode	Treatment Duration*	Tx Frequency
Superficial	8 J/cm2	Pulsed, 700 Hz		3-5x/week

*Duration is related to and set by power

Table 3: Treatment Parameters for Low Level Laser (870 nm).

to have a germicidal effect under either [6]. Application is similar in both devices, however parameters are individual (Tables 1 and 2).

Low Level Laser Therapy

Class III lasers are often referred to as “cold lasers” because they do not create an increase in tissue temperature. This makes it ideal as a therapy during acute early phases of injury. In the early days of research by Mester, it was suspected that the treatment to the incisions of rats healed at an accelerated rate, and this has continued to be an area of research today, proving similar results [7]. A great deal of work has been produced on chronic wounds in ulcers etc., however a commonly cited study on humans was performed on controlled induced abrasions [8].

As the laser thought is thought to create a photobiomodulation to aerobic respiration, it can be used throughout the stages of injury. Although not all mechanisms are clearly understood, this particular study measured wound contraction rates, also typical in other studies. Other benefits may include earlier control of fibrosis formation [9]. Table 3 provides a superficial wound protocol, not dissimilar to the studies performed in post surgical incisions, providing implication for such treatment, however most animal studies utilize shorter wavelengths.

Low level laser therapy has also been implicated to be anti-viral and more recently anti-fungal, in the treatment of foot disorders [10,11]. This work has also provided more insight to dual wavelength device, increasing awareness of cellular response to different wavelengths. Common wavelengths in dual devices include 870 nm and 930 nm. Total energy densities are much higher than most other protocols that

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are attempting to be tissue enhancing, at 270 J/cm². Studies have shown advantages of the dual wavelengths in cases, however still maintain that there is benefit using one wavelength only.

Pulsed Shortwave Diathermy

Shortwave diathermy falls within the electromagnetic spectrum with an emitting frequency of 27.12 MHz. Low intensity pulse is used to deliver non-thermal effect treatments for multiple systems and disorders. In the treatment of superficial wounds, the energy densities have been low, averaging 25 W mean power. Due to the lack of literature and clear protocols, the best recorded was used a 65 microsec phase duration with a 0.5-3.9% duty cycle and peak power range of 293-975 W [12]. Treatment times were 20-30 minutes.

Due to complications of the device and its radiation, shortwave diathermy has not been as common in the clinic as other therapeutic modalities. However, recent devices have improved manufacturing and may provide new avenues for continued research.

Conclusion

Protocols for standard therapeutic ultrasound has not been well established for open wounds, and may be considered contraindicated in superficial wounds. However, there has been work performed with deep ulcers and other ultrasound devices and therefore may provide some insight to further studies and treatment with standard devices.

The intent of this review was not to suggest complete application, as there is an understanding that basic competency has been acquired by the clinician. This is also not to intend to be a complete method of treatment but part of a complete wound management and the clinician should perform due diligence to determine appropriate indications and preparation.

References

1. Hostetter KS, Lux M, Shelley K, Drummond JL, Laguna P (2011) MRSA as a health concern in athletic facilities. *J Environ Health* 74: 18-25.
2. American Physical Therapy Association (2001) Guide to Physical Therapist Practice. Second Edition. American Physical Therapy Association. *Phys Ther* 81: 9-746.
3. David O. Draper (2002) Editorial: Are Certified Athletic Trainers Qualified to Use Therapeutic Modalities? *J Athl Train* 37: 11-12.
4. Foster DT, Rowedder LJ, Reese SK (1995) Management of Sports-Induced Skin Wounds. *J Athl Train* 30: 135-140.
5. Arnheim D, Prentice W. Skin disorders (1993) In: Arnheim D, Prentice W. Principles of Athletic Training. 8th ed. St Louis, MO: Mosby Year Book Publishers 420-435.
6. Merriman HL, Hegyi CA, Albright-Overton CR, Carlos J Jr, Putnam RW, et al. (2004) A comparison of four electrical stimulation types on *Staphylococcus aureus* growth in vitro. *J Rehabil Res Dev* 41: 139-146.
7. Demidova-Rice TN, Salomatina EV, Yaroslavsky AN, Herman IM, Hamblin MR (2007) Low-Level Light Stimulates Excisional Wound Healing in Mice. *Lasers Surg Med* 39: 706-715.
8. Hopkins JT, McLoda TA, Seegmiller JG, David Baxter G (2004) Low-Level Laser Therapy Facilitates Superficial Wound Healing in Humans: A Triple-Blind, Sham-Controlled Study. *J Athl Train* 39: 223-229.
9. Fillipin LI, Mauriz JL, Vedovelli K, Moreira AJ, Zettler CG, et al. (2005) Low-level laser therapy (LLLT) prevents oxidative stress and reduces fibrosis in rat traumatized Achilles tendon. *Lasers Surg Med* 37: 293-300.
10. Mendez TM, Pinheiro AL, Pacheco MT, Nascimento PM, Ramalho LM (2004) Dose and wavelength of laser light have influence on the repair of cutaneous wounds. *J Clin Laser Med Surg* 22: 19-25.
11. Landsman AS, Robbins AH (2012) Treatment of mild, moderate, and severe onychomycosis using 870- and 930-nm light exposure: some follow-up observations at 270 days. *J Am Podiatr Med Assoc* 102: 169-171.
12. Salzberg CA, Cooper-Vastola SA, Perez F, Viehbeck MG, Byrne DW (1995) The effects of non-thermal pulsed electromagnetic energy (Diapulse) on Wound healing of Pressure ulcers in spinal cord injured patients: A randomized, double-blind study. *Ostomy Wound Manage* 41: 42-4, 46, 48.