



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

Photomed Laser Surg. 2011 Feb;29(2):109-14. doi: 10.1089/pho.2009.2680. Epub 2011 Jan 9.

A RANDOMIZED CLINICAL TRIAL ON THE EFFECT OF LOW-LEVEL LASER THERAPY ON CHRONIC DIABETIC FOOT WOUND HEALING: A PRELIMINARY REPORT

Kaviani A, Djavid GE, Ataie-Fashtami L, Fateh M, Ghodsi M, Salami M, Zand N, Kashef N, Larijani B | Department of Surgery, Imam Khomeini Hospital, Tehran University of Medical Sciences, Tehran, Iran |

ABSTRACT

BACKGROUND AND OBJECTIVES: Low-level laser therapy (LLLT) has been shown to promote chronic wound healing in conditions of reduced microcirculation. In this preliminary study, we report the results of using LLLT to heal foot ulcers in patients with diabetes mellitus.

MATERIALS AND METHODS: Twenty-three patients with a diabetic foot wound for at least 3 months were included in this double-blind randomized clinical trial. Patients were randomized to receive placebo treatment (n = 10) or LLLT (n = 13) (685 nm, energy density 10 J/cm(2)) in addition to conventional therapy. Patients were followed for 20 weeks. Ulcer size reduction and the number of patients with complete healing were compared between the LLLT and placebo groups.

RESULTS: There were no significant differences in baseline characteristics of patients and foot ulcers receiving LLLT and placebo treatment. At week 4, the size of ulcers decreased significantly in the LLLT group (p = 0.04). After 20 weeks, in the LLLT group, eight patients had complete healing and in the placebo group only three patients experienced complete wound healing. The mean time of complete healing in LLLT patients (11 weeks) was less than that in placebo patients (14 weeks) though the difference was not statistically significant.

CONCLUSIONS: The study provides evidence that LLLT can accelerate the healing process of chronic diabetic foot ulcers, and it can be presumed that LLLT may shorten the time period needed to achieve complete healing.

Wound Repair Regen. 2016 Mar;24(2):418-26. doi: 10.1111/wrr.12399. Epub 2016 Mar 2.

A SYSTEMATIC REVIEW OF LOW-LEVEL LIGHT THERAPY FOR TREATMENT OF DIABETIC FOOT ULCER

Tchanque-Fossuo CN1,2, Ho D1, Dahle SE2,3, Koo E1, Li CS4, Isseroff RR1,2, Jagdeo J1,2,5 | 1-Dermatology Service, Sacramento VA Medical Center, Mather, California | 2-Department of Dermatology, University of California Davis, Sacramento, California | 3-Department of Surgery, Podiatry Section, Sacramento VA Medical Center, Mather, California | 4 - Department of Public Health Sciences, Division of Biostatistics, University of California Davis, Davis, California | 5-Department of Dermatology, State University of New York Downstate Medical Center, Brooklyn, New York |

ABSTRACT

Diabetes mellitus (DM) is a significant international health concern affecting more than 387 million individuals. A diabetic person has a 25% lifetime risk of developing a diabetic foot ulcer (DFU), leading to limb amputation in up to one in six DFU patients. Low-level light therapy (LLLT) uses low-power lasers or light-emitting diodes to alter cellular function and molecular pathways, and may be a promising treatment for DFU. The goal of this systematic review is to examine whether the clinical use of LLLT is effective in the healing of DFU at 12 and 20 weeks in comparison with the standard of care, and to provide evidence-based recommendation and future clinical guidelines for the treatment of DFU using LLLT. On September 30, 2015, we searched PubMed, EMBASE, CINAHL, and Web of Science databases using the following terms: "diabetic foot" AND "low level light therapy," OR "light emitting diode," OR "phototherapy," OR "laser." The relevant articles that met the following criteria were selected for inclu-



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

sion: randomized control trials (RCTs) that investigated the use of LLLT for treatment of DFU. Four RCTs involving 131 participants were suitable for inclusion based upon our criteria. The clinical trials used sham irradiation, low dose, or nontherapeutic LLLT as placebo or control in comparison to LLLT. The endpoints included ulcer size and time to complete healing with follow-up ranging from 2 to 16 weeks. Each article was assigned a level of evidence (LOE) and graded according to the Oxford Center for Evidence-based Medicine Levels of Evidence Grades of Recommendation criteria. Limitations of reviewed RCTs include a small sample size ($N < 100$), unclear allocation concealment, lack of screening phase to exclude rapid healers, unclear inclusion/exclusion criteria, short (< 30 days) follow-up period, and unclear treatment settings (wavelength and treatment time). However, all reviewed RCTs demonstrated therapeutic outcomes with no adverse events using LLLT for treatment of DFU. This systematic review reports that LLLT has significant potential to become a portable, minimally invasive, easy-to-use, and cost effective modality for treatment of DFU. To enthusiastically recommend LLLT for treatment of DFU, additional studies with comparable laser parameters, screening period to exclude rapid healers, larger sample sizes and longer follow-up periods are required. We envision future stringent RCTs may validate LLLT for treatment of DFU. Systematic review registration number: PROSPERO CRD42015029825.

EFFICACY OF LIGHT-EMITTING DIODE THERAPY ON DIABETIC FOOT ULCERS

Heba A. Bahey El-Deen (1), Adel A. Nossier (2) and, Mona M | Soliman (3) | 1- Faculty of Physical Therapy, Misr University for Science and Technology | 2-Physical Therapy Department for Surgery, Faculty of Physical Therapy, Cairo University| 3-Dermatology Department, National Institute of Laser Enhanced Sciences, Cairo University|

ABSTRACT

The aim of this study was to determine the efficacy of light-emitting diode therapy in enhancement of chronic diabetic foot ulcer. Fifty patients participated in the study. They suffered from chronic foot ulcer as a complication of diabetes mellitus, their ages ranged from 50 to 70 years old. They classified into two equal groups (LED therapy group and standard medical therapy group). LED group received light – emitting diode therapy in addition to standard medical treatment for thirty sessions., while standard medical group received standard medical treatment only also for thirty sessions. Additionally two weeks period of follow up was added to the total program. There was statistical significant reduction in wound surface area after 15 and 30 sessions ($P < 0.05$). There was also a statistical significant improvement in the degree of healing rate in LED therapy group through histopathological assessment of the tissue biopsy after 30 sessions. There were (16%) with fair healing, (76%) with moderate healing (8%) with excellent healing. While, in standard medical therapy group all patients (100%) were presented with poor healing. Therefore, light-emitting diode therapy is an effective, innovative, non expensive modality in the treatment of diabetic foot ulcer combined with standard medical treatment.

SUBJECTS: Fifty patients (44 males and 6 females) with type II diabetes mellitus and chronic full thickness (grade I) diabetic foot ulcers lasting longer than two months were recruited in the study.

CONCLUSIONS: From the obtained results of this present study, it may be concluded that Light Emitting Diode Therapy has a significant effect in acceleration of diabetic foot ulcer healing by improving micro circulation and increasing transcutaneous oxygen saturation to the ulcer region which lead to a significant contribution in the improvement of the patient's functional level, the quality of life and solving a major economical problem that face team members of ulcer rehabilitation.



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

Photomedicine and laser surgery 29(6):399-404 • June 2011

VISIBLE LIGHT-INDUCED HEALING OF DIABETIC OR VENOUS FOOT ULCERS: A PLACEBO-CONTROLLED DOUBLE-BLIND STUDY

Zvi Landau, Michal Migdal, Anat Lipovsky, Rachel Lubart | Bar Ilan University

ABSTRACT

Non-healing ulcers represent a significant dermatological problem. Recently, conventional therapy-resistant chronic ulcers have been treated with low energy lasers or light-emitting diodes in the visible and near IR region, but only a few placebo-controlled double-blind studies have been performed to support the efficacy of this approach. The aim of the present study was to evaluate the efficacy of a broadband (400-800 nm) visible light device in the treatment of leg or foot ulcers. A placebo-controlled double-blind study using broadband light source (400-800 nm) was performed on patients with diabetic foot ulcers or patients with chronic leg ulcers. The treatment group was illuminated with 180 mW/cm² broadband light twice a day for 4 min/session, while patients in the placebo group received non-healing light fluency (10 mW/cm²) projections. The treatment group included 10 patients with a total of 19 ulcers, whereas in the placebo group, 6 patients had 6 ulcers. The follow-up period was 12 weeks. At the end of the follow up, all the wounds were closed in 9 out of 10 patients (90%) from the treatment group, whereas in the placebo group only 2 out of 6 patients exhibited closed wounds (33%). The reduction in wound size in the treatment group versus the placebo group was 89% and 54%, respectively. In this small scale placebo-controlled double-blind study, broadband (400-800 nm) visible light was an effective modality for the treatment of leg or foot ulcers.

Indian Journal of Surgery 74(5):359-363 • October 2012

EFFICACY OF LOW LEVEL LASER THERAPY ON WOUND HEALING IN PATIENTS WITH CHRONIC DIABETIC FOOT ULCERS – A RANDOMIZED CONTROL TRIAL

Basavaraj M. Kajagar (1), Ashok S. Godhi (1), Archit Pandit (1), S. Khatri (2) | 1- Department of Surgery Jawaharlal Nehru Medical CollegeBelgaumIndia | 2- KLE'S College of PhysiotherapyBelgaumIndia |

ABSTRACT

Foot ulcers are serious complications of Diabetes Mellitus (DM) and are known to be resistant to conventional treatment. They may herald severe complications if not treated wisely. Electromagnetic radiations in the form of photons are delivered to the ulcers in laser form to stimulate healing. This study was conducted to evaluate the efficacy of Low Level Laser Therapy (LLLT) in diabetic ulcer healing dynamics. To determine mean percentage reduction of wound area in study and control groups. Settings: KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum. Study Design: Randomized-Control Study. Methods: A total of 68 patients with Type 2 DM having Meggitt-Wagner Grade I foot ulcers of atleast more than 4 weeks duration, less than 6 × 6 cm² with negative culture were studied. Patients were randomized into two groups of 34 each. Patients in study group received LLLT with conventional therapy and those in control group were treated with conventional therapy alone. Healing or percentage reduction in ulcer area over a period of 15 days after commencement of treatment was recorded. Statistical Analysis: Unpaired Student T Test and Mann Whitney U test. Mean age of the patients was 50.94 years in control group and 54.35 years in study group (p = 0.065). There was no significant difference between control and study group with respect to mean FBS and HbA1c levels (p > 0.05), suggesting no biochemical differences between two groups. Initial ulcer area was 2608.03 mm² in study group and 2747.17 mm² in control group



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

($p = 0.361$). Final ulcer area was 1564.79 mm² in study group and 2424.75 mm² in control group ($p = 0.361$). Percentage ulcer area reduction was 40.24 ± 6.30 mm² in study group and 11.87 ± 4.28 mm² in control group ($p < 0.001$, $Z = 7.08$). Low Level Laser Therapy is beneficial as an adjunct to conventional therapy in the treatment of diabetic foot ulcers (DFU).

Lasers Surg Med. 2009 Aug;41(6):433-41. doi: 10.1002/lsm.20789

PHOTOTHERAPY PROMOTES HEALING OF CHRONIC DIABETIC LEG ULCERS THAT FAILED TO RESPOND TO OTHER THERAPIES

Minatel DG, Frade MA, França SC, Enwemeka CS | Department of Biotechnology, University of Ribeirão Preto, Ribeirão Preto, Brazil |

ABSTRACT

OBJECTIVE: We tested the hypothesis that combined 660 and 890 nm LED phototherapy will promote healing of diabetic ulcers that failed to respond to other forms of treatment.

RESEARCH DESIGN AND METHODS: A double-blind randomized placebo controlled design was used to study 23 diabetic leg ulcers in two groups of 14 patients. Group one ulcers were cleaned, dressed with 1% silver sulfadiazine cream and treated with "placebo" phototherapy (< 1.0 J cm⁻²) twice per week, using a Dynatron Solaris 705(R) device. Group two ulcers were treated similarly but received 3 J cm⁻² dose.

RESULTS: At each of 15, 30, 45, 60, 75, and 90 days of healing, mean ulcer granulation and healing rates were significantly higher for group two than the "placebo" group ($P < 0.02$). While "placebo" treated ulcers worsened during the initial 30 days, group two ulcers healed rapidly; achieving 56% more granulation and 79.2% faster healing by day 30, and maintaining similarly higher rates of granulation and healing over the "placebo" group all through. By day 90, 58.3% of group two ulcers had healed fully and 75% had achieved 90-100% healing. In contrast, only one "placebo" treated ulcer healed fully by day 90; no other ulcer attained $>$ or $=$ 90% healing.

CONCLUSION: Combined 660 and 890 nm light promotes rapid granulation and healing of diabetic ulcers that failed to respond to other forms of treatment.

HighBeam Research | The Diabetic Foot | 12/22/2005

LOW-LEVEL LASER THERAPY FOR DIABETIC FOOT WOUND HEALING (WOUND CARE)

Hourelid, Nicolette;Abrahamse, Heidi

ABSTRACT

INTRODUCTION: An alternative to traditional treatment modalities for diabetic ulcers is low-level laser therapy (LLLT). A number of published studies demonstrate the beneficial effects of LLLT (Ribeiro et al, 2002), although several other studies also exist which indicate results to the contrary (Malm and Lundeborg, 1991; Loevschall and Arenholt-Bindslev, 1994). Further work focusing on cellular and molecular mechanisms of responses to laser irradiation is required to establish LLLT as a reliable, safe and inexpensive treatment modality. This article reviews LLLT as a treatment modality for diabetic ulcers.



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

852 - Acta Cirúrgica Brasileira - Vol. 30 (12) 2015

EFFECTS OF LOW-LEVEL LASER THERAPY (LLLT) IN THE PROCESS OF HEALING DIABETIC FOOT ULCERS

Maura Cristina Porto Feitosa (1), Ana Flávia Machado de Carvalho (2), Valrian Campos Feitosa (3), Isabely Madalena Coelho (4), Raurys Alencar de Oliveira (5), Emília Ângela Loschiavo Arisawa (6) | 1-Fellow PhD degree, Postgraduate Program in Biomedical Engineering, Universidade do Vale do Paraíba (UNIVAP), Sao Jose dos Campos-SP, Brazil | 2-Fellow PhD degree, Postgraduate Program in Biomedical Engineering, UNIVAP, Sao Jose dos Campos-SP, Brazil | 3-Medical angiologist, Hospital Getúlio Vargas (HGV), Teresina-PI, Brazil | 4-Graduate student, Universidade Estadual do Piauí (UESPI), Teresina-PI, Brazil | Acquisition of data. VPhD, Postgraduate Program in Biomedical Engineering, UNIVAP, Sao Jose dos Campos-SP, Brazil. Acquisition of data. VIAssociate Professor, IPD, UNIVAP, Sao Jose dos Campos-SP, Brazil. Scientific and intellectual content of the study, interpretation of data, critical revision.

ABSTRACT

PURPOSE: To evaluate the effects of the low-level laser therapy applying Laser on the tissue repair in ulcer carriers due to diabetes.

METHODS: Sixteen type II diabetic patients, ulcer carriers in the lower limbs, participated in the research from which eight were in the control group and eight were submitted to the low-level laser therapy with a pulsed wave form, visible ray, wave length of 632.8 nm, 30 mW peak power, (Laser – HTM). The application time was of 80 (4J/cm²) seconds. The application was punctual without contact (approximately 1 mm of distance), the pen being held in a perpendicular position related to the wound, in equidistant points. There were 12 appointments, of which three were done weekly in alternated days. Photograph records and an application of the brief inventory of pain were done before and after 30 days of follow-up.

RESULTS: There was a significant decrease in the size of the wound when compared to the control group ($p < 0.05$). The pain was also reported as having an intense improvement in the treated group.

CONCLUSION: The low-level laser treatment seems to be an efficient method, viable, painless and of low costs concerning the tissue repair ulcers in a diabetic foot.

Laser Medicine Research Section, Biological and Medical Research Department, King Faisal Specialist Hospital and Research Centre, Riyadh, Kingdom of Saudi Arabia | Photomedicine and laser surgery| Feb. 2009

LASER THERAPY CONVERTS DIABETIC WOUND HEALING TO NORMAL HEALING

Farouk A H Al-Watban

ABSTRACT

OBJECTIVE: We have determined optimal laser dosimetric parameters in comparison with polychromatic light-emitting diodes (LEDs) that can speed up healing in four animal models: nondiabetic oval full-thickness wounds, diabetic oval full-thickness wounds, non-diabetic burns, and diabetic burns in Sprague-Dawley rats.

MATERIALS AND METHODS: This series of studies used 532-, 633-, 810-, 980-, and 10,600-nm lasers (visible to far infrared) and polychromatic LED clusters (510-872 nm, visible to infrared) as photon sources. Sprague-Dawley rats ($n = 893$) were used; however, animals that died before and during the experiments from anesthesia accidents and for any other reason were excluded from statistical analysis.

RESULTS: The improvements seen (>10% improvement of impairment) show that phototherapy with the 633-nm laser is quite promising for alleviating diabetic wound and burn healing, and exhibited the best results with 38.5% and 53.4% improvements, respectively.



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

CONCLUSIONS: In this induced-diabetes model, wound and burn healing were improved by 40.3% and 45%, respectively, in 633-nm laser dosimetry experiments, and diabetic wound and burn healing was accelerated by phototherapy. This indicates that the healing rate was normalized in the phototherapy-treated diabetic rats. In view of these interesting findings, 633-nm laser therapy given three times per week at 4.71 J/cm(2) per dose for diabetic burns, and three times per week at 2.35 J/cm(2) per dose for diabetic wound healing are recommended as actual doses for human clinical trials, especially after major surgery in those with impaired healing, such as diabetics and the elderly.

Int Wound J. 2013 Apr;10(2):121-31. doi: 10.1111/j.1742-481X.2012.01085.x. Epub 2012 Sep 7.

ELECTROPHYSICAL THERAPY FOR MANAGING DIABETIC FOOT ULCERS: A SYSTEMATIC REVIEW

Kwan RL1, Cheing GL, Vong SK, Lo SK | Department of Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong SAR, China

ABSTRACT

To systematically assess published reports on the efficacy of electrophysical therapy in the treatment of diabetic foot ulcers, including electrical stimulation, low-level laser therapy, therapeutic ultrasound and electromagnetic therapy. Databases searched included MEDLINE, CINAHL, EMBASE and the Cochrane Central Register of Controlled Trials (CENTRAL) from 1966 to 2011. Studies reviewed included only randomized controlled trials (RCTs) on treatment with electrophysical modalities compared with sham, conventional treatment or other electrophysical modalities. Information extracted were objective measures of healing and data useful for the calculation of effect size. Eight RCTs were eventually included in the critical appraisal, with a combined total of 325 participants. Five studies were conducted on electrical stimulation, two on phototherapy and one on ultrasound. All studies reported that the experimental group was significantly more favourable than the control or sham group. The pooled estimate of the number of healed ulcers of the three studies on electrical stimulation compared to the control or sham electrical stimulation showed statistical significance [mean difference of 2.8 (95% CI = 1.5-5.5, P = 0.002] in favour of electrical stimulation. The results indicated potential benefit of using electrophysical therapy for managing diabetic foot ulcers. However, due to the small number of trials ever conducted, the possibility of any harmful effects cannot be ruled out, and high-quality trials with larger sample sizes are warranted.

IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 14, Issue 9 Ver. I (Sep. 2015), PP 110-114

ANTIBACTERIAL EFFECTS OF LOW LEVEL LASER THERAPY IN INFECTIVE DIABETIC FOOT ULCERS

Prashant Tubachi (1), Ashok Godhi (2) | 1- Department of Surgery KMC Manipal, India | 2-Department of Surgery JNMC Belgaum India

ABSTRACT

BACKGROUND: Patients with diabetes mellitus frequently present with foot infections as a complication, which are up to 20% of hospital admissions. On treatment of the wounds with low level laser therapy (LLLT) major changes (increased granulation tissue, fibroblast proliferation, collagen synthesis, early epithelialization and



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

enhanced neovascularisation) can be seen. The objective of study was to assess anti-infective property of LLLT in diabetic infections.

METHODOLOGY: The present randomized controlled trial was conducted in Department of Surgery, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum on 60 patients with infected diabetic foot ulcers for the duration of one year. Patients were divided into two groups using computerized randomization chart. Group I received conventional dressing with betadine and group II received LLLT along with conventional dressing. Both groups received empirical oral antibiotic (Ciprofloxacin-Tinidazole) for two days and culture sensitive antibiotic later. The wound culture was repeated on fifth day and tenth day of treatment.

RESULTS: In this study control group had 25 males and 5 female and study group had 23 males and 7 females. Twenty four (24 that is 80%) patients had positive ulcer culture in control group and culture negative ulcer were 6 (20%) on tenth day. In study group culture positive ulcers were 20 (66.66%) and culture negative ulcers were 10 (33.33%) ($p=0.3811$).

CONCLUSIONS: The wound subjected to LLLT with conventional therapy showed decreased infection rate at 10th day of culture as compared to conventional dressing group alone.

BMC Musculoskeletal Disorders | 27 May 2009

THE MANAGEMENT OF NEUROPATHIC ULCERS OF THE FOOT IN DIABETES BY SHOCK WAVE THERAPY

Biagio Moretti (1,3,5), Angela Notarnicola (1), Giulio Maggio (2), Lorenzo Moretti (1), Michele Pascone (2), Silvio Tafuri (4) and Vittorio Patella (1) | 1- Department of Clinical Methodology and Surgical Techniques, Orthopedics Section, Faculty of Medicine and Surgery of University of Bari, General Hospital, Piazza Giulio Cesare 11, 70124 Bari, Italy | 2- Plastic Surgery Unit, Faculty of Medicine and Surgery of University of Bari, General Hospital, Piazza Giulio Cesare 11, 70124 Bari, Italy | 3-President of Course of Motor and Sports Sciences, Faculty of Medicine and Surgery of University of Bari, General Hospital, Piazza Giulio Cesare 11, 70124 Bari, Italy | 4-Hygiene Section, Department of Biomedical Sciences and Human Oncology, Faculty of Medicine and Surgery of University of Bari, General Hospital, Piazza Giulio Cesare 11, 70124 Bari, Italy | 5-SITOD, Italian Society of Shock Waves Therapy, Naples, Italy |

ABSTRACT

BACKGROUND: Diabetes is becoming one of the most common chronic diseases, and ulcers are its most serious complication. Beginning with neuropathy, the subsequent foot wounds frequently lead to lower extremity amputation, even in the absence of critical limb ischemia. In recent years, some researchers have studied external shock wave therapy (ESWT) as a new approach to soft tissue wound healing. The rationale of this study was to evaluate if ESWT is effective in the management of neuropathic diabetic foot ulcers.

METHODS: We designed a randomized, prospective, controlled study in which we recruited 30 patients affected by neuropathic diabetic foot ulcers and then divided them into two groups based on different management strategies. One group was treated with standard care and shock wave therapy. The other group was treated with only standard care. The healing of the ulcers was evaluated over 20 weeks by the rate of re-epithelization.

RESULTS: After 20 weeks of treatment, 53.33% of the ESWT-treated patients had complete wound closure compared with 33.33% of the control patients, and the healing times were 60.8 and 82.2 days, respectively ($p < 0.001$). Significant differences in the index of the re-epithelization were observed between the two groups, with values of 2.97 mm²/die in the ESWT-group and 1.30 mm²/ die in the control group ($p < 0.001$).

CONCLUSION: Therefore, ESWT may be a useful adjunct in the management of diabetic foot ulceration.



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

An Bras Dermatol. 2016 Jul-Aug; 91(4): 489–493.

LASER THERAPY IN WOUND HEALING ASSOCIATED WITH DIABETES MELLITUS – REVIEW

Raquel Gomes de Sousa¹ and Keila de Nazaré Madureira Batista¹ | ¹ - Universidade Federal do Pará (UFPA) - Belém (PA), Brazil |

ABSTRACT

The article discusses the results of a literature review on the application of low intensity laser therapy on the healing of wounds associated diabetes mellitus in the last 10 years.

OBJECTIVE: To determine the most effective parameter in healing wounds related to diabetes mellitus, as well as the most widely used type of laser.

METHODOLOGY: consisted of bibliographic searching the databases Bireme, SciELO, PubMed/Medline and Lilacs by using the keywords related to the topic. Were selected from these keywords, papers discussing the use of laser on wounds associated with diabetes, published in the period 2005-2014, in Portuguese or English.

RESULTS: After analyzing the research, 12 studies consistent with the theme were selected.

CONCLUSION: Based on this review, the studies that showed more satisfactory results in healing diabetic wounds were those who applied energy densities in the range of 3-5 J/cm², power densities equal to or below 0.2 W/cm² and continuous emission. The He-Ne laser with a wavelength of 632.8 nm was used more often.

International Wound Journal | May 2008 | Volume 5, Issue 2 | Pages 118–368

LOW LEVEL LASER THERAPY FOR HEALING ACUTE AND CHRONIC WOUNDS – THE EXTENDICARE EXPERIENCE

Anita E. Saltmarche RN, MHS, VP of Clinical and Scientific Affairs, MedX Health Inc., 3350 Ridgeway Dr., Unit 3, Mississauga, ON, Canada

ABSTRACT

The purpose of the study is to assess the effectiveness of low level laser therapy for wound healing when combined with the Extendicare Wound Prevention and Management Program. Sixteen residents at a Canadian Extendicare nursing home had a total of 27 sites treated consisting of 23 open wounds and 4 'at risk' areas. Of the 23 open wounds, two wounds in between toes were not able to be 'traced' and deemed 'immeasurable' wounds, resulting in 21 open, measured wounds. The four 'at risk' (closed) areas were treated preventatively. Pressure, venous insufficiency and diabetic wounds were included. The majority (12/21) or 57.1%, of the wounds were chronic (≥3 months duration) and 42.9% were acute (<3 months duration). The primary outcome measures included the PUSH Tool score, EZ Graph™ tracings and photographs. Secondary outcome measures were employed to better understand potential barriers to successful integration into clinical practice. Feedback on the effectiveness of low level laser therapy, the education program and determinations of hands-on relevance was sought from staff. At the end of the 9-week trial, the majority (61.9%) of the 21 wounds achieved significant improvement (≥50% wound closure). Nine (42.8%) had 100% closure. Some improvement was seen in 14.3% and 23.8% of wounds demonstrated no change. Chronic and acute wounds had similar improvement. None of the wounds in this debilitated, frail population deteriorated during the study and no negative consequences of treatment were encountered. Without staff support, even if new technology has positive clinical outcomes, success would be limited. Staff rated low level laser, easy to learn and use, effective for the majority of their residents worth the additional time. Staff requested a continuation of low level laser even after study completion.

Sci Rep. 2016 Feb 2;6:20084. doi: 10.1038/srep20084



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT)
for a wide variety of Clinical Indications

ADDITIVE ENHANCEMENT OF WOUND HEALING IN DIABETIC MICE BY LOW LEVEL LIGHT AND TOPICAL COQ10

Mao Z (1,2), Wu JH (2), Dong T(2), Wu MX(2) | 1-ShangHai 9th People Hospital, Shanghai Jiao Tong University School of Medicine, ShangHai, China | 2-Wellman Center for Photomedicine, Massachusetts General Hospital, Department of Dermatology, Harvard Medical School, Boston, MA 02114

ABSTRACT

Diabetes, a highly prevalent disease that affects 9.3% of Americans, often leads to severe complications and slow wound healing. Preclinical studies have suggested that low level light therapy (LLLT) can accelerate wound healing in diabetic subjects, but significant improvements must be made to overcome the absence of persuasive evidence for its clinical use. We demonstrate here that LLLT can be combined with topical Coenzyme Q10 (CoQ10) to heal wounds in diabetic mice significantly faster than LLLT alone, CoQ10 alone, or controls. LLLT followed by topical CoQ10 enhanced wound healing by 68~103% in diabetic mice in the first week and more than 24% in the second week compared with untreated controls. All wounds were fully healed in two weeks following the dual treatment, in contrast to only 50% wounds or a fewer being fully healed for single or sham treatment. The accelerated healing was corroborated by at least 50% higher hydroxyproline levels, and tripling cell proliferation rates in LLLT and CoQ10 treated wounds over controls. The beneficial effects on wound healing were probably attributed to additive enhancement of ATP production by LLLT and CoQ10 treatment. The combination of LLLT and topical CoQ10 is safe and convenient, and merits further clinical study.

Journal of athletic training 39(3):223-229 • February 2004 with 134 Reads

LOW-LEVEL LASER THERAPY FACILITATES SUPERFICIAL WOUND HEALING IN HUMANS: A TRIPLE-BLIND, SHAM-CONTROLLED STUDY

Todd A McLoda - Illinois State University | Jeff G. Seegmiller - University of Idaho | G D Baxter - University of Otago

ABSTRACT

OBJECTIVE: Low-level laser therapy (LLLT) has been promoted for its beneficial effects on tissue healing and pain relief. However, according to the results of in vivo studies, the effectiveness of this modality varies. Our purpose was to assess the putative effects of LLLT on healing using an experimental wound model.

DESIGN AND SETTING: We used a randomized, triple-blind, placebo-controlled design with 2 within-subjects factors (wound and time) and 1 between-subjects factor (group). Data were collected in the laboratory setting. **SUBJECTS:** Twenty-two healthy subjects (age = 21 +/- 1 years, height = 175.6 +/- 9.8 cm, mass = 76.2 +/- 14.2 kg). **MEASUREMENTS:** Two standardized 1.27-cm(2) abrasions were induced on the anterior forearm. After wound cleaning, standardized digital photos were recorded. Each subject then received LLLT (8 J/cm(2); treatment time = 2 minutes, 5 seconds; pulse rate = 700 Hz) to 1 of the 2 randomly chosen wounds from either a laser or a sham 46-diode cluster head. Subjects reported back to the laboratory on days 2 to 10 to be photographed and receive LLLT and on day 20 to be photographed. Data were analyzed for wound contraction (area), color changes (chromatic red), and luminance.

RESULTS: A group x wound x time interaction was detected for area measurements. At days 6, 8, and 10, follow-up testing revealed that the laser group had smaller wounds than the sham group for both the treated and the untreated wounds (P < .05). No group x wound x time differences were detected for chromatic red or luminance.

CONCLUSIONS: The LLLT resulted in enhanced healing as measured by wound contraction. The untreated wounds in subjects treated with LLLT contracted more than the wounds in the sham group, so LLLT may produce an indirect healing effect on surrounding tissues. These data indicate that LLLT is an effective modality to facilitate wound contraction of partial-thickness wounds.



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

Lasers Surg Med. 1985;5(1):31-9

THE BIOMEDICAL EFFECTS OF LASER APPLICATION

Mester E, Mester AF, Mester A.

ABSTRACT

This paper briefly reviews the authors' experimental and clinical use of lasers over a 20-year period, during which laser effects on 15 biological systems were studied. Low-energy laser radiation was found to have a stimulating effect on cells, and high-energy radiation had an inhibiting effect. The application of lasers to stimulate wound healing in cases of nonhealing ulcers is recommended.

Acta Cirúrgica Brasileira - Vol 21 (3) 2006 – 177 Work performed at the Department of Biomechanics, Medicine and Rehabilitation of the Locomotor Apparatus, Faculty of Medicine, University of São Paulo (USP), Ribeirão Preto - SP Brazil.

ANALYSIS OF THE INFLUENCE OF LOW-POWER HeNe LASER ON THE HEALING OF SKIN WOUNDS IN DIABETIC AND NON-DIABETIC RATS

Paulo de Tarso Camillo de Carvalho (2), Nilton Mazzer (3), Filipe Abdalla dos Reis (4), Ana Carulina Guimarães Belchior (4), Iandara Schettert Silva (5) | 1-Work performed at the Department of Biomechanics, Medicine and Rehabilitation of the Locomotor Apparatus, Faculty of Medicine, University of São Paulo (USP), Ribeirão Preto - SP Brazil | 2-PhD, Department of Physiotherapy, University for State and Pantanal Region Development (UNIDERP), Campo Grande – MS. Brazil | 3-Associate Professor, Department of Biomechanics, Medicine and Rehabilitation of the Locomotor Apparatus, Faculty of Medicine, USP, Ribeirão Preto - SP. Brazil | 4-Assistant Professor, Department of Physiotherapy, UNIDERP, Campo Grande – MS. Brazil | 5-PhD, Department of Veterinary Medicine, UNIDERP, Campo Grande – MS. Brazil.

ABSTRACT

PURPOSE: To study the influence of HeNe laser irradiation on the collagen percentage in surgically-induced skin wounds in rats with and without alloxan-induced diabetes, by morphometric analysis of collagen fibers.

METHODS: 48 male Wistar rats were used, divided into groups: laser-treated diabetic (group 1); untreated diabetic (group 2); treated non-diabetic (group 3); and untreated non-diabetic (group 4). For groups 1 and 2, diabetes was induced by intravenous injection of alloxan (2,4,5,6-tetraoxypyrimidine; 5,6-dioxyuracil; Sigma), into the dorsal vein of the penis, at a rate of 0.1 ml of solution per 100 g of body weight. A wound was made on the back of all the animals. Groups 1 and 3 were treated with HeNe laser (4 J/cm²) for 60 s. One animal from each group was sacrificed on the 3rd, 7th and 14th days after wounding. Samples were taken, embedded in paraffin, stained with hematoxylin-eosin and Masson's trichrome, and morphometrically analyzed using the Imagelab software. The percentages of collagen fibers were determined from the samples from the euthanasia animals. The data were treated statistically using analysis of variance (ANOVA) and the Student t and Kruskal-Wallis tests. The significance level was set at 0.05 or 5%.

RESULTS: The results obtained from the samples taken on the third, seventh and fourteenth days after wounding demonstrated that the laser-treated group presented a statistically significant ($p < 0.05$) greater mean quantity of collagen fibers than in the non-treated group, both for diabetic rats ($p = 0.0104$) and for non-diabetic rats ($p = 0.039$).

CONCLUSION: The low-power laser (632.8 nm) was shown to be capable of influencing the collagen percentage in skin wounds by increasing the mean quantity of collagen fibers, both for the diabetic and for the non-diabetic group.



RUMIDIMUR DMCC
THE PART OF RUVEIDIEN GROUP

AG Tower, 28C, JLT, Dubai, UAE
Tel: + (971) 4 513 6460
rumidimur@rumidimur.com
www.rumidimur.com

STUDIES OVERVIEW

Efficacy of Soft Laser Treatment (LLLT) for a wide variety of Clinical Indications

Photomed Laser Surg. 2006 Dec;24(6):705-14.

EFFECT OF MULTIPLE EXPOSURES OF LOW-LEVEL LASER THERAPY ON THE CELLULAR RESPONSES OF WOUNDED HUMAN SKIN FIBROBLASTS

Hawkins D, Abrahamse H | Laser Research Unit, Group of Health Sciences, University of Johannesburg, Doornfontein, Johannesburg, South Africa |

ABSTRACT

OBJECTIVE: This study aimed to establish the behavior of wounded human skin fibroblasts (HSF) after helium-neon (HeNe) (632.8 nm) laser irradiation using one, two, or three exposures of different doses, namely, 2.5, 5.0, or 16.0 J/cm² on each day for 2 consecutive days.

BACKGROUND DATA: Low-level laser therapy (LLLT) is a form of phototherapy used to promote wound healing in different clinical conditions. LLLT at than adequate wavelength, intensity, and dose can accelerate tissue repair. However, there is still conflicting information about the effect of multiple irradiations on the cellular responses of wounded cells.

METHODS: Cellular responses to HeNe laser irradiation were evaluated by measuring changes in cell morphology, cell viability, cell proliferation, and damage caused by multiple irradiations.

RESULTS: A single dose of 5.0 J/cm², and two or three doses of 2.5 J/cm² had a stimulatory or positive effect on wounded fibroblasts with an increase in cell migration and cell proliferation while maintaining cell viability, but without causing additional stress or damage to the cells. Multiple exposures at higher doses (16 J/cm²) caused additional stress, which reduces cell migration, cell viability, and ATP activity, and inhibits cell proliferation.

CONCLUSION: The results show that the correct energy density or fluence (J/cm²) and number of exposures can stimulate cellular responses of wounded fibroblasts and promote cell migration and cell proliferation by stimulating mitochondrial activity and maintaining viability without causing additional stress or damage to the wounded cells. Results indicate that the cumulative effect of lower doses (2.5 or 5 J/cm²) determines the stimulatory effect, while multiple exposures at higher doses (16 J/cm²) result in an inhibitory effect with more damage.