

Authors: Mathur RK, Sahu K, Saraf S, Patheja P, Khan F, Gupta PK

Source: Lasers Med Sci, February 2017

Abstract

Foot ulcers are serious complications of diabetes mellitus (DM) and are known to be resistant to conventional treatment.

This study was conducted to evaluate the efficacy of low-level laser therapy (LLLT) for the treatment of diabetic foot ulcers in a tertiary care centre (Department of Surgery, Mahatma Gandhi Memorial Medical College and Maharaja Yashwantrao Hospital, A.B. Road, Indore).

A total of 30 patients with type 2 DM having Meggitt-Wagner grade I foot ulcers of more than 6 weeks duration with negative culture were studied. Patients were randomized into two groups of 15 each. Patients in study group received LLLT (660 ± 20 nm, 3 J/cm²) along with conventional therapy and those in control group were treated with conventional therapy alone. The primary outcome measure was the absolute and relative wound size reduction at 2 weeks compared to the baseline parameter. Percentage ulcer area reduction was $37 \pm 9\%$ in the LLLT group and $15 \pm 5.4\%$ in the control group ($p < 0.001$). For ~75% of wounds of the treatment group, wound area reduction of 30-50% was observed. In contrast, for the control group, ~80% of wounds showed a wound area reduction of <20% on day 15. Further, the wounds with initial wound area 1000-2000 mm² seems to have better final outcome than the groups with larger areas. The treated groups showed higher amount of granulation than the control group.

The results suggest that LLLT is beneficial as an adjunct to conventional therapy in the treatment of diabetic foot ulcers.

Conclusion

The treated groups showed higher amount of granulation than the control group. The results suggest that LLLT is beneficial as an adjunct to conventional therapy in the treatment of diabetic foot ulcers.

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Authors: Abeer A. Yamany, Hayam M. Sayed

Source: Journal of Advanced Research, 2012

Abstract

Diabetic neuropathy is the most common complication and greatest source of morbidity and mortality in diabetic patients. Thirty male and female patients with painful diabetic neuropathy and abnormal results from nerve conduction studies participated in this study. Their ages ranged from 45 to 60 years with a mean of $52.1 \pm SD 4.7$ years.

Patients were randomly assigned into two equal groups of 15, an active laser group (laser group) and a placebo laser group (control group). The laser group received scanning helium neon (He-Ne) infrared laser with wavelength 850 nm and density of 5.7 J/cm^2 , applied to the lumbosacral area and the plantar surface of the foot for 15 min each site/session three times per week for four weeks (i.e. 12 sessions).

Pain intensity via visual analogue scale, bilateral peroneal motor nerves, sural sensory nerves conduction velocity and amplitude and foot skin microcirculation, were measured pre- and post-treatment for both groups.

Pain was significantly decreased ($p \leq 0.05$) and electrophysiological parameters and foot skin microcirculation were significantly improved ($p \leq 0.05$) in the laser group, while no significant change was obtained in the control group.

Conclusion

Low level laser therapy within the applied parameters and technique could be an effective therapeutic modality in reducing pain and improving neurovascular function in patients with diabetic polyneuropathy.

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Influence of low-intensity laser therapy on spatial perception threshold and electroneurographic finding in patients with diabetic polyneuropathy

Authors: Perić Z

Source: Srp Arh Celok Lek, May 2007

Abstract

Low-intensity laser therapy (LILT) can be applied in cases when patients with diabetic polyneuropathy (DPN) suffer from chronic severe neuropathic pain. We wanted to analyse influence of LILT on spatial perception threshold (SPT) and electroneurographic (ENG) parameters in patients with painful DPN. METHOD: We analysed 45 patients (25 males), average age 54.3 years (54.3 +/- 10.9), with clinical and ENG signs of painful DPN. The patients were divided into two groups: A and B. Group A consisted of 30 patients with DPN who had 30 LILT treatments over the period of 12 weeks and group B consisted of 15 patients with DPN who received only vitamin therapy per os within the same period. Prior to and after 12 weeks of treatment, the following ENG parameters were determined using surface electrodes: motor (MCV) and sensory conduction velocities (SCV) values (in m/s) of nervus (n.) peroneus (NP), n. tibialis (NT) and n. medianus (NM) and their motor distal latency (MDL) values (in ms). SPT value (score as number from 1 to 8) was determined with Tactile Circumferential Discriminator on dorsal part of foot's big toe skin. For statistical analysis, we used Student's t-test and Pearson correlation (sig. 2 tailed) study. RESULTS; We registered statistically significant difference between SPT ($p < 0.01$) values prior to (5.25 +/- 1.11) and after (4.87 +/- 0.90) LILT, as well as NMMCV ($p < 0.05$) values prior to (47.18 +/- 5.08) and after (49.12 +/- 3.72) LILT. Besides, we registered, only after LILT, statistically significant correlation between SPT and NMDML ($p < 0.01$) values and also between SPT and NMSCV ($p < 0.05$) values. The differences and correlations between other analysed parameters before and after treatments were not significant ($p > 0.05$).

Conclusion

In this study we registered significant decrease of SPT and increase of NMMCV after LILT and that indicated a favourable effect of this treatment in analysed patients with painful DPN. In our opinion these results need further investigation.

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Laser therapy and electric stimulation in rehabilitation treatment of peripheral neuropathy

Authors: Miriutova NF, Abdulkina NG, Luksha LV, Levitskiĭ EF

Source: Vopr Kurortol Fizioter Lech Fiz Kult, Jul 2002

Abstract

3 patients with compression-ischemic myeloradiculopathy received treatment including infrared laser radiation on the paravertebral fields, motor points of the affected nerves and biologically active points Y63, Y67, YB34, YB42, YB43, E34, E42 (1.0-5.0 mW/cm²; 5 and 5000 Hz), electrostimulation of motor nerve points and innervated by them muscles by double square impulses with a fixed gap 5 ms

Conclusion

Impulse infrared laser therapy relieves pain syndrome, stimulates repair processes in the affected nerve structures. Further modified electric stimulation activates a regenerative growth of the nerve fibers, reinnervation

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Low-intensity laser therapy for painful symptoms of diabetic sensorimotor polyneuropathy: a controlled trial

Authors: Zinman LH, Ngo M, Ng ET, Nwe KT, Gogov S, Bril V.

Source: Diabetes Care, Toronto General Hospital, April 2004

Abstract

Low-intensity laser therapy (LILT) has been advocated for treatment of chronic pain disorders. Although the mechanism of pain relief is uncertain, this therapy has been suggested for relief of painful symptoms of diabetic sensorimotor polyneuropathy (DSP). The objective of this study was to determine whether LILT relieves the pain of DSP.

We conducted a randomized, double-masked, sham therapy-controlled clinical trial in 50 patients with painful DSP diagnosed with the Toronto Clinical Neuropathy Score. All patients received sham therapy over a 2-week baseline period and were then randomized to receive biweekly sessions of either sham or LILT for 4 weeks. The primary efficacy parameter was the difference in the weekly mean pain scores on a visual analog scale (VAS). **RESULTS:** The patients had similar baseline characteristics for pain intensity, HbA(1c), and duration of DSP. Both groups noted a decrease in weekly mean pain scores during sham treatment. After the 4-week intervention, the LILT group had an additional reduction in weekly mean pain scores of -1.0 ± 0.4 compared with -0.0 ± 0.4 for the sham group ($P = 0.07$). LILT had no effect on the Toronto Clinical Neuropathy Score, nerve conduction studies, sympathetic skin response, or quantitative sensory testing.

Conclusion

Although an encouraging trend was observed with LILT, the study results do not provide sufficient evidence to recommend this treatment for painful symptoms of DSP.

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Diabetic distal symmetric polyneuropathy: effect of low-intensity laser therapy

Authors: Khamseh ME, Kazemikho N, Aghili R, Forough B, Lajevardi M, Hashem Dabaghian F, Goushegir A, Malek M.

Source: Lasers Med Sci, November 2011

Endocrine Research Center (Firouzgar), Institute of Endocrinology and Metabolism (Hemmat Campus), Tehran University of Medical Sciences, Tehran, Iran

Abstract

Low-intensity laser therapy (LILT) has been considered as a treatment modality in diabetic distal symmetric polyneuropathy (DSP). The aim of this study is to determine the effectiveness of LILT on DSP. We examined 107 subjects with type 2 diabetes for detection of DSP using the Michigan Neuropathy Screening Instrument (MNSI). Seventeen subjects were eligible to be enrolled in the study. Nerve conduction studies (NCS) were performed in all eligible subjects as an objective method to confirm neuropathy. The participants received LILT three times a week for ten sessions. NCSs were reevaluated after completion of the treatment. The absolute changes in NCS parameters were considered to establish the effectiveness of the treatment. Baseline demographics were similar in all participants. The mean differences of NCV parameters were considered for comparison. At the end of the study, the subjects showed a significant increase in neural potential amplitudes ($p < 0.05$).

Conclusion

This study clearly demonstrated a significant positive effect of LILT on improvement of nerve conduction velocity on diabetic distal symmetric polyneuropathy (DSP). This finding supports the therapeutic potential of LILT in DSP.

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Influence of low-level laser on pain and inflammation in type 2 diabetes mellitus with diabeticdermopathy - A case report

Authors: Hazari A, K N S, K Rao K, G Maiya A.

Source: Cosmet Laser There, May 2017

Abstract

Numerous skin lesions have been commonly observed in individuals with diabetes mellitus. The common skin manifestations of diabetes mellitus are erythrasma, xanthomatosis, xanthelasma, phycomycetes and cutaneous infections like furunculosis, candidiasis, carbuncle, dermatophytosis, etc. Diabetic dermopathy is the most common skin lesion found in patients with diabetes. It is typically seen in men aged above 50 years. In low-level laser therapy (LLLT), the entire lower limb was illuminated with the frequency of 20 Hz and wavelength of 830 nm for 9 min, and the treatment was divided into four parts. With the continued sessions of LLLT, the skin manifestations and neuropathy conditions improved drastically. On the 21st day, the skin colour was found to be normal.

Conclusion

There were significant changes in clinical findings for diabetic peripheral neuropathy. LLLT with specific exercises can promote healing of skin manifestations in individuals with type 2 diabetes mellitus. It can be used as an effective treatment modality for treating diabetic dermopathy.

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Photobiostimulation reverses allodynia and peripheral nerve damage in streptozotocin-induced type 1 diabetes

Authors: Rocha IR, Ciena AP, Rosa A, Martins DO, Chacur M

Source: Lasers Med Sci, April 2017

Abstract

For better evaluation of the efficacy of low-level laser therapy in treating painful diabetic neuropathy and in protecting nerve fiber damage, we conducted a study with type 1 diabetic rats induced by streptozotocin. It is well known that diabetic peripheral neuropathy is the leading cause of pain in those individuals who suffer from diabetes. Despite the efficacy of insulin in controlling glucose level in blood, there is no effective treatment to prevent or reverse neuropathic damage for total pain relief. Male Wistar rats were divided into saline, vehicle, and treatment groups. A single intraperitoneal (i.p.) injection of streptozotocin (STZ) (85 mg/kg) was administered for the induction of diabetes. The von Frey filaments were used to assess nociceptive thresholds (allodynia). Behavioral measurements were accessed 14, 28, 48, and 56 days after STZ administration. Rats were irradiated with GaAs Laser (Gallium Arsenide, Laserpulse, Ibramed Brazil) emitting a wavelength of 904 nm, an output power of 45 mWpk, beam spot size at target 0.13 cm², a frequency of 9500 Hz, a pulse time 60 ns, and an energy density of 6,23 J/cm².

Conclusion

The application of four sessions of low-level laser therapy was sufficient to reverse allodynia and protect peripheral nerve damage in diabetic rats. The results of this study indicate that low-level laser therapy is feasible to treat painful diabetic condition in rats using this protocol. Although its efficacy in reversing painful stimuli and protecting nerve fibers from damage was demonstrated, this treatment protocol must be further evaluated in biochemical levels to confirm its biological effects.

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Influence of low-intensity laser therapy on spatial perception threshold and electroneurographic finding in patients with diabetic polyneuropathy

Authors: Perić Z

Source: Srp Arh Celok Lek, May 2007

Abstract

Low-intensity laser therapy (LILT) can be applied in cases when patients with diabetic polyneuropathy (DPN) suffer from chronic severe neuropathic pain. We wanted to analyse influence of LILT on spatial perception threshold (SPT) and electroneurographic (ENG) parameters in patients with painful DPN. **METHOD:** We analysed 45 patients (25 males), average age 54.3 years (54.3 +/- 10.9), with clinical and ENG signs of painful DPN. The patients were divided into two groups: A and B. Group A consisted of 30 patients with DPN who had 30 LILT treatments over the period of 12 weeks and group B consisted of 15 patients with DPN who received only vitamin therapy per os within the same period. Prior to and after 12 weeks of treatment, the following ENG parameters were determined using surface electrodes: motor (MCV) and sensory conduction velocities (SCV) values (in m/s) of nervus (n.) peroneus (NP), n. tibialis (NT) and n. medianus (NM) and their motor distal latency (MDL) values (in ms). SPT value (score as number from 1 to 8) was determined with Tactile Circumferential Discriminator on dorsal part of foot's big toe skin. For statistical analysis, we used Student's t-test and Pearson correlation (sig. 2 tailed) study. **RESULTS;** We registered statistically significant difference between SPT ($p < 0.01$) values prior to (5.25 +/- 1.11) and after (4.87 +/- 0.90) LILT, as well as NMMCV ($p < 0.05$) values prior to (47.18 +/- 5.08) and after (49.12 +/- 3.72) LILT. Besides, we registered, only after LILT, statistically significant correlation between SPT and NMDML ($p < 0.01$) values and also between SPT and NMSCV ($p < 0.05$) values. The differences and correlations between other analysed parameters before and after treatments were not significant ($p > 0.05$).

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Infrared laser therapy in distal diabetic polyneuropathy

Authors: Kalinina OV, Alekseeva NV, Burtsev EM.

Source: Zh Nevrol Psikhiatr Im S S Korsakova, 1998

Abstract

A course of laser therapy was applied to 50 patients with diabetic polyneuropathy by laser irradiation of low intensiveness in the nearest infrared spectrum. 20 patients from the group were treated by monotherapy only by laser exposure. Control group consisted of 24 patients treated by conventional therapy without laser exposure. According to the changes of vibratory and algesic sensitivity and electromyographic data the efficiency of therapy was estimated. It was found that laser exposure resulted in more pronounced restoration of functional state of nervous fibers than conventional therapy.

Conclusion

Application of laser irradiation of low intensiveness was effective while in combined

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Authors: Hazari A., K N S, K. Rao K., G. Maiya A.

Source: A Hazari et al. J Cosmet Laser Ther, May 2017

Abstract

Numerous skin lesions have been commonly observed in individuals with diabetes mellitus. The common skin manifestations of diabetes mellitus are erythrasma, xanthomatosis, xanthelasma, phycomycetes and cutaneous infections like furunculosis, candidiasis, carbuncle, dermatophytosis, etc. Diabetic dermopathy is the most common skin lesion found in patients with diabetes. It is typically seen in men aged above 50 years. In low-level laser therapy (LLLT), the entire lower limb was illuminated with the frequency of 20 Hz and wavelength of 830 nm for 9 min, and the treatment was divided into four parts. With the continued sessions of LLLT, the skin manifestations and neuropathy conditions improved drastically. On the 21st day, the skin colour was found to be normal. Also, there were significant changes in clinical findings for diabetic peripheral neuropathy. LLLT with specific exercises can promote healing of skin manifestations in individuals with type 2 diabetes mellitus. It can be used as an effective treatment modality for treating diabetic dermopathy.

Conclusion

LLLT with specific exercises can promote healing of skin manifestations in individuals with type 2 diabetes mellitus. It can be used as an effective treatment modality for treating diabetic dermopathy.

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Authors: Hronkova H, Navratil L, Skopek J, Kymplova J

Source: Laser Partner Clinicexperience (2000) No. 21, 19

Abstract

Objective: To compare the effectiveness of the two therapeutic approaches, ultrasound and low level laser used in patients suffering from calcar calcaneus-plantar fasciitis.

Methods: 171 patients with calcar calcaneus and plantar fasciitis diagnosed with the x-ray were divided into four groups.

Group A - 60 patients treated with ultrasound therapy (UST). Ultrasound with the output of 1 W per cm² was applied for 5 minutes in each of 10 applications and the head of device pointed to the place of maximum pain;

Group B - 61 patients were treated with low level laser therapy (LLLT) without any additional treatment including pharmacotherapy. Laser with 870 nm of wavelength, output of 200 mW, was applied on the place of maximum pain. Energy density of 9 J/cm² in the series of 10 laser applications every other day was used.

Group C - 8 patients where previous UST had no or minimal effect and therefore LLLT was subsequently applied the same way as in the group B. Laser was applied not earlier than 14 days after the ultrasound.

Group D (Control) - In this group of 52 patients the sham laser radiation (no laser beam) was applied whereas patient and personnel could not identify whether the laser was shamed or not. This group is used as control "placebo" group.

The effectiveness of the treatment was determined according to the evaluation of the patient using certain criteria described in the table.

Results: The complete disappearance of pain was seen in 50% of patients, partial improvement in 16.6% and no effect in 33.3% of patients treated with US.

In Group B, where LLLT has been used, 64% of patients described disappearance of pain, 26% with improvement and in 10% of patients this therapy brought no effect. In the Group C of previous UST and subsequent use of LLLT, 75% of patients evaluated their treatment as successful. In 25% however, laser had no effect. In summary, 69 patients were treated with LLLT from which 67% described complete pain relief, 20% partial improvement and in 13% laser brought no effect.

In the Group D there were 50 patients treated with sham laser and full effect was seen in 18% of them, partially reduced pain in 42% and without any effect in 40%.

Conclusion

The results show that the LLLT is a good therapeutic approach in the treatment of pain in patients suffering from calcar-calcaneus - plantar fasciitis. The treatment with laser was significantly more successful than the ultrasound therapy, which is currently the most common therapy used for plantar fasciitis.

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Ultrasonographic evaluation of plantar fasciitis after low-level laser therapy: results of a double-blind, randomized, placebo-controlled trial

Authors: Kiritsi O, Tsitas K, Malliaropoulos N, Mikroulis G.

Source: Lasers Med Sci, March 2010

Abstract

The aim of this study was to investigate the effect of low-level laser therapy (LLLT) on plantar fasciitis documented by the ultrasonographic appearance of the aponeurosis and by patients' pain scores. Thirty individuals with diagnosis of unilateral plantar fasciitis were enrolled in a randomized, double-blind, placebo-controlled trial, but 25 participants completed the therapeutic protocol. The contralateral asymptomatic fascia was used as control. After enrolment, symptomatic individuals were randomly assigned to receive LLLT, or identical placebo, for 6 weeks. Ultrasonography was performed at baseline and after completion of therapy. The subjective subcalcaneal pain was recorded at baseline and after treatment on a visual analogue scale (VAS). After LLLT, plantar fascia thickness in both groups showed significant change over the experimental period and there was a difference (before treatment and after treatment) in plantar fascia thickness between the two groups. However, plantar fascia thickness was insignificant (mean 3.627 +/- 0.977 mm) when compared with that in the placebo group (mean 4.380 +/- 1.0042 mm). Pain estimation on the visual analogue scale had improved significantly in all test situations (after night rest, daily activities) after LLLT when compared with that of the placebo group. (P=0.006 and P=0.01, respectively). Additionally, when the difference in pain scores was compared between the two groups, the change was statistically significant (after night rest P=0.000; daily activities P=0.001). In summary, while ultrasound imaging is able to depict the morphologic changes related to plantar fasciitis, 904 nm gallium-arsenide (GaAs) infrared laser may contribute to healing and pain reduction in plantar fasciitis.

Conclusion

In summary, while ultrasound imaging is able to depict the morphologic changes related to plantar fasciitis, 904 nm gallium-arsenide (GaAs) infrared laser may contribute to healing and pain reduction in plantar fasciitis.

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Authors: Morimoto Y, Saito A, Tokuhashi Y.

Source: Laser Ther, 2013

Abstract

Our hospital has used LLLT in the treatment of athletes since 1990. We had a good result about LLLT for sports injuries. However, few articles have attempted to evaluate the efficacy of LLLT for sports injuries. The aims of this study was to evaluate the efficacy of LLLT for sports injuries.

Materials (Subjects) and Methods:

Forty one patients underwent LLLT in our hospital. These patients included 22 men and 19 women with an average age of 38.9 years old. Patients were irradiated by diode laser at points of pain and/or acupuncture points. Patients underwent LLLT a maximum treatment of 10 times (mean 4.1 times). We evaluated the efficacy of LLLT using a Pain relief score (PRS). A score of 2 to 5 after treatment was regarded as very good, 6 to 8 as good, and 9 to 10 as poor. A PRS score of less than 5 was regarded as effective.

Results:

The rate of effectiveness (PRS of 5 or less) after LLLT was 65.9% (27/41 patients).

Discussion:

In this study, the resulting rate of effectiveness was 65.9% for all sports injuries. However, we have a high rate of effectiveness for Jumper's knee, tennis elbow and Achilles tendinitis and cases that were irradiated laser by a physician.

Conclusion

LLLT is an effective treatment for sports injuries, particularly jumper's knee, tennis elbow and Achilles tendinitis.

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A randomised, placebo controlled trial of low level laser therapy for activated Achilles tendinitis with microdialysis measurement of peritendinous prostaglandin E2 concentrations



Authors: Bjordal JM, Lopes-Martins RA, Iversen VV

Source: Br J Sports Med, January 2006

Abstract

Low level laser therapy (LLLT) has gained increasing popularity in the management of tendinopathy and arthritis. Results from in vitro and in vivo studies have suggested that inflammatory modulation is one of several possible biological mechanisms of LLLT action.

Objective:

To investigate in situ if LLLT has an anti-inflammatory effect on activated tendinitis of the human Achilles tendon.

Seven patients with bilateral Achilles tendinitis (14 tendons) who had aggravated symptoms produced by pain inducing activity immediately before the study.

Method:

Infrared (904 nm wavelength) LLLT (5.4 J per point, power density 20 mW/cm²) and placebo LLLT (0 J) were administered to both Achilles tendons in random blinded order.

Results:

Ultrasonography Doppler measurements at baseline showed minor inflammation through increased intratendinous blood flow in all 14 tendons and measurable resistive index in eight tendons of 0.91 (95% confidence interval 0.87 to 0.95). Prostaglandin E2 concentrations were significantly reduced 75, 90, and 105 minutes after active LLLT compared with concentrations before treatment ($p = 0.026$) and after placebo LLLT ($p = 0.009$). Pressure pain threshold had increased significantly ($p = 0.012$) after active LLLT compared with placebo LLLT: the mean difference in the change between the groups was 0.40 kg/cm² (95% confidence interval 0.10 to 0.70).

Conclusion

LLLT at a dose of 5.4 J per point can reduce inflammation and pain in activated Achilles tendinitis. LLLT may therefore have potential in the management of diseases with an inflammatory component.

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Authors: Stergioulas A

Source: J Clin Laser Med Surg., April 2004

Abstract

Low-level laser therapy (LLLT) has been used for the last few years to treat sports injuries. The purpose of this study was to compare three therapeutic protocols in treating edema in second degree ankle sprains that did not require immobilization with a splint, under placebo-controlled conditions.

Forty-seven soccer players with second degree ankle sprains, selected at random, were divided into the following groups: The first group (n = 16) was treated with the conventional initial treatment (RICE, rest, ice, compression, elevation), the second group (n = 16) was treated with the RICE method plus placebo laser, and the third group (n = 15) was treated with the RICE method plus an 820-nm GaAlAs diode laser with a radiant power output of 40 mW at 16 Hz. Before the treatment, and 24, 48, and 72 h later, the volume of the edema was measured.

A three by three repeated measures ANOVA with a follow up post hoc test revealed that the group treated with the RICE and an 820-nm GaAlAs diode laser presented a statistically significant reduction in the volume of the edema after 24 h (40.3 +/- 2.4 mL, $p < 0.01$), 48 h (56.4 +/- 3.1 mL, $p < 0.002$), and 72 h (65.1 +/- 4.4 mL, $p < 0.001$).

Conclusion

LLLT combined with RICE can reduce edema in second-degree ankle sprains.

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