Photomed Laser Surg. 2009 Oct;27(5):703-8.

The effects of low-level laser therapy on bone in diabetic and nondiabetic rats.

Bayat M, Abdi S, Javadieh F, Mohsenifar Z, Rashid MR.

Source

Cellular and Molecular Biology Research Center, Medical Faculty, Shahid Beheshti University, MC, Tehran, Iran.
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Abstract

OBJECTIVE:
The aim of the present study was to examine the effects of low-level laser therapy (LLLT) on the tibia of streptozotocin-induced diabetic (STZ-D) rats.

BACKGROUND DATA:
LLLT has been found to accelerate fracture healing in animals. Diabetes mellitus decreases bone volume and its biomechanical parameters.

MATERIALS AND METHODS:
Twenty rats were divided randomly into four groups. Rats in the first two groups were administrated a single injection of STZ to induce diabetes, while animals in groups 3 and 4 were given a sham injection of distilled water. The right tibia in groups 1 and 2 was treated with a He-Ne laser (632.8 nm, 10 mW) of 28.6 and 382.2 J/cm(2), respectively. LLLT was performed daily for 14 consecutive days. The right tibia of rats in group 3 was treated with LLLT the same as group 2. The right tibia of rats in group 4 was used for based line studies. After 14 d, right tibiae and left tibiae (control bone) were extracted and subjected to the three-point bending test and histological study.

RESULTS:
Maximum force (N) was significantly greater in laser-treated bones of groups 2 and 3 compared with their relevant control groups (paired Student t test, $p = 0.05$ and $p = 0.007$, respectively). Density of the bone lamella meshwork of compact bone in group 2 was significantly greater in comparison with its control group (paired Student t test, $p = 0.005$).

CONCLUSION:
LLLT on tibia of STZ-D rats increased the bone lamella meshwork density of compact bone and also increased its strength.

PMID:19698018[PubMed - indexed for MEDLINE]

Evaluating the Efficiency of Low Level Laser Therapy (LLLT) in Combination With Intravenous Laser Therapy (IVL) on Diabetic Foot Ulcer, Added to Conventional Therapy Journal of Lasers in Medical Sciences, 2011(Issue 1) Soheila Mokmeli MD , Mahrokh Daemi MD , Zahra Ayatollahzadeh Shirazi MD, Fatemah Ayatollahzadeh Shirazi PhD , Mitra Hajizadeh MD

Introduction: Low level laser therapy (LLLT) is gaining acceptance in clinical applications. For example, it is used as therapeutic modality in the repair of diabetic foot ulcer when conventional therapy was not effective, separately. The aim of this study is to determine the effect of local and intravenous LLLT for the healing of diabetic foot ulcer.

Material & Methods: This study contains 74 diabetic foot-ulcers which were prone to resistance to conventional therapy. Different stages of diabetic foot are included in this study. The wounds irradiation are performed by the combination therapy of 650 nm and 860 nm laser, with the total energy density of 3.6 J/cm² plus intravenous laser therapy (IVL) with 2.5 MW, 650 nm laser used for 30 minutes. All wounds have been photographed from equal distance, before and after treatments, and all the wounds were staged by a surgeon who was disinterested and neutral about the effects of the laser therapy. Her judgments were based on the visual assessments of the wounds. All the mathematical and statistical analysis is based on the descriptive statistics which, is done by the SPSS 16.

Results: in the result of this study; 62.2% (Forty-six out of the 74 ulcers) completely healed, 12.2% (Nine in numbers) healed more than 50%, 8.1% (Six in numbers) healed less than 50%, 5.4% (Four in numbers) not healed,12.2% (Nine in numbers) did not continue their treatment (less than 5 sessions of Laser therapy). Excluding, the wounds in stage 5, more than 80% of each stage's wound, completely healed more than 50%, with in 2 months duration. In this study, we definitely can express that, all the Patients received some degrees of healing, during their laser receiving treatments.

Conclusion: The combined local and intravenous LLLT promote the tissue repair process of diabetic foot ulcer. In this multi-disciplinary method, we achieved a remarkably shorter mean healing time of two months, compared with other reported studies with healing time of three to six months.

Keywords: wound, ulcer, Diabetic, Foot, Laser therapy, LLLT,

Evaluating the Effect of the Different Diabetic Control's Methods Including Tight Control on the Healing Response of Diabetic Foot Ulcer Treated with Low Level Laser Therapy (LLLT)

Soheila Mokmeli , Zahra Ayatollahzadeh Shirazi , Mahrokh Daemi , Fatemah Ayatollahzadehshirazi , Alireza Soosanabadi , Mitra Hajizadeh

Language: EnglishJ ournal of Lasers in Medical Sciences, 2011(Issue 1)Abstract:

Summary Low-level laser therapy (LLLT) is shown effective in healing diabetic foot ulcer when combined with conventional therapy. Since; Diabetes mellitus is a leading cause of impaired wound healing. The aim of this study is to determine the effect of different diabetic control's methods on the healing response of diabetic foot ulcer in those patients treated with Low level laser therapy (LLLT), added to conventional therapy.This study contains 74 diabetic foot-ulcers which most of them prone to resistance to conventional therapy. Different stages of diabetic foot ulcers and ways of controlling blood glucose level are included in this study. There were 3 response groups;Group 1- Insulin receiving patients, most of them had a very tight blood glyceamic level profile controlling. Group 2- Non-insulin receiving or drug dependent patients, had a periodical blood glyceamic level profile with flatuance. Group 3- Mixed methods. Most of the patients in this group had tight blood glyceamic level profile controlling. The way to control blood glucose level should be according to the internist`s consult. The wounds irradiation are performed by the combination of infra-red and red, (860 nm and 650 nm) laser, with the total energy density of 3.6 J/cm² in addition of intravenous laser therapy (IVL) with 2.5 MW, 650 nm (red) laser used for 30 minutes. All wounds have been photographed from equal distance, before and after treatments, and all the wounds were staged by a surgeon who was neutral about the effects of the laser therapy. The surgeon's judgment was established only by the visual assessments of the wounds. All the mathematical and statistical analysis is based on the descriptive statistics using the software package SPSS16.
LLLT promote the tissue repair process of diabetic foot ulcer. Healing response of the patients was not dependent on methods of controlling blood glucose level. Previously it was reported that tight control of diabetes containing continuous subcutaneous insulin infusion and others on split mixed doses promotes healing of diabetic foot lesions. In this study; we found interruption of LLLT in the treatment of diabetic wound; can give a very acceptable result even in the absence of tight controlling of glucose level. When the quantity presentations value of the mean blood glucose level distribution was on the range of 144- 275 mg/dl. In this multi-disciplinary method we achieved a remarkably shorter mean healing time of two months, compared with other reported studies with healing time of three to six months.

Keywords:
Wound Healing; Ulcer; laser therapy, Low level; Lasers; Endpoint Determination; Diabetic Foot

The effects of low-level laser therapy on bone in diabetic and nondiabetic rats.

photomed Laser Surg. 2009 Oct;27(5):703-8.

Bayat M, Abdi S, Javadieh F, Mohsenifar Z, Rashid MR. Cellular and Molecular Biology Research Center, Medical Faculty, Shahid Beheshti University, MC, Tehran, Iran. bayat_m@yahoo.com

Abstract

OBJECTIVE:

The aim of the present study was to examine the effects of low-level laser therapy (LLLT) on the tibia of streptozotocin-induced diabetic (STZ-D) rats.

BACKGROUND DATA:

LLLT has been found to accelerate fracture healing in animals. Diabetes mellitus decreases bone volume and its biomechanical parameters.

MATERIALS AND METHODS:

Twenty rats were divided randomly into four groups. Rats in the first two groups were administrated a single injection of STZ to induce diabetes, while animals in groups 3 and 4 were given a sham injection of distilled water. The right tibia in groups 1 and 2 was treated with a He-Ne laser (632.8 nm, 10 mW) of 28.6 and 382.2 J/cm(2), respectively. LLLT was performed daily for 14 consecutive days. The right tibia of rats in group 3 was treated with LLLT the same as group 2. The right tibia of rats in group 4 was used for based line studies. After 14 d, right tibiae and left tibiae (control bone) were extracted and subjected to the three-point bending test and histological study.

RESULTS:

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CONCLUSION:

LLLT on tibia of STZ-D rats increased the bone lamella meshwork density of compact bone and also increased its strength. PMID:19698018[PubMed - indexed for MEDLINE]

Effect of low-level laser therapy on healing of tenotomized Achilles tendon in streptozotocin-induced diabetic rats.

Nouruzian M, Alidoust M, Bayat M, Bayat M, Akbari M. Lasers Med Sci. 2012 Feb 28. [Epub ahead of print]

Department of Anatomical sciences and Biology, Medical Faculty, Shahid Beheshti University, MC, PO Box 19395/4719, Tehran, 1985717443, Iran, hamidrr2003@yahoo.com.

Abstract

Diabetes mellitus (DM) is associated with musculoskeletal damage. Investigations have indicated that healing of the surgically tenotomized Achilles tendon was considerably augmented following low-level laser therapy (LLLT) in non-diabetic, healthy animals. The aim of the present study was to evaluate the effect of LLLT on the Achilles tendon healing in streptozotocin-induced diabetic (STZ-D) rats via a biomechanical evaluating method. Thirty-three rats were divided into non-diabetic (n = 18) and diabetic (n = 15) groups. DM was induced in the rats by injections of STZ. The right Achilles tendons of all rats were tenotomized 1 month after STZ injections. The two experimental groups (n = 6 for each group) of

non-diabetic rats were irradiated with a helium-neon (He-Ne) laser at 2.9 and 11.5 J/cm(2) for ten consecutive days. The two experimental groups of diabetic rats (n = 5 for each group) were irradiated with a He-Ne laser at 2.9 and 4.3 J/cm(2) for ten consecutive days. The tendons were submitted to a tensiometric test. Significant improvements in the maximum stress (MS) values (Newton per square millimeter) were found following LLLT at 2.9 J/cm(2) in both the non-diabetic (p = 0.031) and diabetic (p = 0.019) experimental groups when compared with their control groups. LLLT at 2.9 J/cm(2) to the tenotomized Achilles tendons in the non-diabetic and diabetic rats significantly increased the strength and MS of repairing Achilles tendons in our study.

PMID:22370620[PubMed - as supplied by publisher]

A histological evaluation of a low-level laser therapy as an adjunct to periodontal therapy in patients with diabetes mellitus.

Lasers Med Sci. 2012 Feb 5. [Epub ahead of print] Obradović R, Kesić L, Mihailović D, Antić S, Jovanović G, Petrović A, Peševska S.

Department of Periodontology and Oral Medicine, Faculty of Medicine, University of Niš, 45/19 Nikola Tesla Blvd, 18000, Niš, Serbia, dr.rada@yahoo.com.

Abstract

Diabetes mellitus (DM) and chronic periodontitis are common chronic diseases in adults in the world population. DM has a strong influence on the oral cavity and represents a risk factor for gingivitis and periodontitis. Low-level laser therapy (LLLT) has proven effective in the reduction of inflammation and swelling. The aim of the present study was to evaluate the efficacy of LLLT in diabetic periodontitis through histological analysis. A total of 300 diabetics with chronic periodontal disease and teeth indicated for extraction were assigned into six equal groups. In the groups 1 and 4, indicated teeth were extracted before treatment, and in the rest of the groups upon completion of the entire treatment. All patients received oral hygiene instructions and full-mouth conservative periodontal treatment. In groups 3 and 6, LLLT was applied (670 nm, 5 mW, 2 J/cm(2), 16 min, 5 days). Histologic findings of gingival tissue treated with LLLT showed expressed healing, as is evident by the absence of inflammatory cells. Tissue edema could not be seen, and the number of blood vessels was reduced. In the gingival lamina, propria pronounced collagenization and homogenization were present. It can be concluded that LLLT has shown efficacy in the treatment of periodontitis in diabetics. Because of more pronounced alterations of periodontium in diabetics, the use of LLLT is of particular importance.

PMID:22311659[PubMed - as supplied by publisher]

Laser photostimulation (660 nm) of wound healing in diabetic mice is not brought about by ameliorating diabetes.

Lasers Surg Med. 2012 Jan;44(1):26-9. doi: 10.1002/lsm.21133. Epub 2011 Nov 22. Peplow PV, Chung TY, Baxter GD. Department of Anatomy and Structural Biology, University of Otago, Dunedin, New Zealand.

phil.peplow@stonebow.otago.ac.nz

Abstract

BACKGROUND AND OBJECTIVES:

We have used a 660-nm laser diode in genetic diabetic mice to stimulate the healing of wounds covered with a Tegaderm HP dressing that causes a retardation of contraction (splinted wounds). It is possible that the stimulation of healing could be due to possible diabetes-modifying properties of laser light. This has been examined by using the 660 nm laser to irradiate non-wounded diabetic mice with the same dose and at same location as for wounded diabetic mice.

MATERIALS AND METHODS:
Twenty-two diabetic mice were used and divided into two equal groups. Body weight and water intake of mice were measured daily for 7 days prior to the start of treatment (Day 0). The left flank of mice in the experimental group was irradiated with 660 nm laser, 100 mW, 20 seconds/day, 7 days; for mice in the control group, the left flank was sham-treated with the laser power supply not switched on. Body weight and water intake of mice were measured to Day 14. On Day 14, the mice were fasted for 4 hours, anaesthetized with sodium pentobarbitone (i.p.) and blood collected by cardiac puncture into heparinized tubes. The plasma was assayed for glucose and glycated hemoglobin A1c.
RESULTS:
There were no significant differences in body weight and water intake over 22 days between mice in the experimental group and control group. On day 14, the mean blood plasma glucose level was not significantly different between the two groups; glycated hemoglobin A1c was not detected in the samples.

CONCLUSION:
Irradiation of the left flank in diabetic mice with 660 nm laser system does not have a significant hypoglycemic effect, and the laser-stimulated healing of wounds in diabetic mice is due to cellular and biochemical changes in the immediate wound environment.

 PMID:22109569[PubMed - indexed for MEDLINE]

Laser photobiomodulation of wound healing in diabetic and non-diabetic mice: effects in splinted and unsplinted wounds.

Photomed Laser Surg. 2010 Apr;28(2):251-61. Chung TY, Peplow PV, Baxter GD.

Department of Anatomy & Structural Biology, University of Otago, Dunedin, New Zealand.

Abstract

OBJECTIVE:
The aim of this investigation was to compare the healing of laser-irradiated and non-irradiated wounds covered by an occlusive dressing in mice.
BACKGROUND DATA:
Many previous studies of the effects of laser irradiation of experimental wounds in mice and rats did not cover the wounds so that healing occurred mainly by contraction. Healing of covered wounds is slower and mimics more closely wound healing in humans.
MATERIALS AND METHODS:
Forty-seven diabetic and twenty non-diabetic mice were used. A single wound (5 mm diameter) was created on the left flank of each animal and covered by Tegaderm HP dressing (Day 1). Wounds were irradiated (660 nm) for 20 s using a lower power (18 mW) or higher power (80 mW) laser starting immediately post-wounding for seven consecutive days (0.36 or 1.6 J/day); untreated wounds served as controls. Animals were euthanized on Day 8, 10, or 14. Wound specimens were cut and stained using haematoxylin and eosin, and picrosirius red, and examined by microscopy.
RESULTS:
Results confirmed that wound healing was impaired in diabetic mice. Analysis of the data demonstrated that Tegaderm HP dressing had retarded contraction (splinted the wounds) in a large proportion of diabetic mice and, to a lesser extent, in non-diabetic mice. Healing of splinted wounds was delayed compared to unsplinted wounds, but laser irradiation (1.6 J/day, 7 days) stimulated healing by re-epithelization and granulation tissue formation.
CONCLUSION:

These are the first findings of laser-mediated stimulation of healing in splinted wounds. Further studies are needed to assess the effects of different constellation sets of laser parameters in this wound model.

PMID:19916792 [PubMed - indexed for MEDLINE]

[Low power laser efficacy in the therapy of inflamed gingive in diabetics with parodontopathy].

Vojnosanit Pregl. 2011 Aug;68(8):684-9.

Obradović R, Kesić L, Jovanović G, Petrović D, Goran R, Mihailović D. [Article in Serbian]

Medicinski fakultet, Klinika za stomatologiju, Odeljenje za oralnu medicinu i parodontologiju, Nis, Srbija. dr.rada@yahoo.com

Abstract

BACKGROUND/AIM:

There is clear evidence on direct relationship between periodontal disease and diabetes mellitus. Many investigations point out greater prevalence and severity of periodontal disease among diabetic patients. During last decade, low level laser therapy has been used in periodontal therapy. It has biostimulative effect, accelerates wound healing, minimizes pain and swelling, and there is almost no contraindication for its usage. The aim of the paper was to investigate the efficiency of low level laser therapy as adjuvant tool in reduction of gingival inflammation in diabetic patients.

METHODS:

The study incuded 150 participants divided into three groups: group I (50 participants with diabetes mellitus type 1 and periodontal disease), group II (50 participants with diabetes mellitus type 2 and periodontal disease), group III (nondiabetic participants with periodontal disease). Gingival health evaluation was done using gingival index Löe-Silness. Soft and hard deposits were removed, periodontal pockets cleaned and GaA1Aslow level laser therapy (5 mW) applied five consecutive days. In each patient, low level laser therapy was not applied on the left side of the jaw in order to compare the effects of the applied therapy. After the first, third and fifth therapy and one month after the last visit gingival index was evaluated. Before the first and after the fifth therapy exfoliative cytology of gingiva was done and nuclei areal was analyzed morphometrically.

RESULTS:

After all investigated periods, gingival index and nuclei areal were significantly decreased comparing to values before the therapy, at both jaw sides ($p < 0.001$). After the 1st, 3rd and 5th therapy, the t-test showed a significantly decreased gingival index at the lased side of jaw comparing to non-lased side.

CONCLUSION:

Low level laser therapy is efficient in gingival inflammation elimination and can be proposed as an adjuvant tool in basic periodontaltherapy of diabetic patients.PMID:21991792[PubMed - indexed for MEDLINE]

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

Lasers Med Sci. 2011 Nov;26(6):831-5. Epub 2011 Aug 19.

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

Endocrine Research Center (Firouzgar), Institute of Endocrinology and Metabolism (Hemmat Campus), Tehran University of Medical Sciences, Tehran, Iran. m-khamseh@tums.ac.ir

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 ($p < 0.05$). 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.

PMID:21853320[PubMed - indexed for MEDLINE]

Effect of 980-nm GaAlAs diode laser irradiation on healing of extraction sockets in streptozotocin-induced diabetic rats: a pilot study.

lasers Med Sci. 2012 Jan;27(1):223-30. Epub 2011 Jul 6.

Park JJ, Kang KL.Department of Periodontology, School of Dentistry, Kyung Hee University, Seoul, Korea.

Abstract

Low-level laser irradiation can promote the healing process in soft and hard tissue but the precise mechanisms are unclear. In this study, we examined the effect of LLLT (low-level laser therapy) on the healing of extraction sockets in diabetic and healthy rats. Forty-eight Sprague-Dawley rats were divided into normal (n = 24) and diabetic (n = 24) rats, and streptozotocin (STZ) injection was used to induce diabetes in the latter. The left and right maxillary first molars of all the rats were extracted. In the non-diabetic rats, the left extraction sockets were not irradiated (group 1) and the right ones were irradiated daily for 3, 5, 7, and 14 days after extraction with a galium-aluminum-arsenide (GaAlAs) diode laser (group 2), and in the diabetic rats, similarly the left ones were not irradiated (group 3) and the right ones were irradiated (group 4). Specimens acquired at these intervals were examined by hematoxylin and eosin (H&E) staining and reverse transcription polymerase chain reaction (RT-PCR). Histological observations and gene expression analyses revealed that groups 2 (normal rats with LLLT) and 4 (diabetic rats with LLLT) showed faster initial healing and more new alveolar bone formation than group 1 (normal rats without LLLT) and group 3 (diabetic rats without LLLT), respectively. We conclude that 980-nm GaAlAs low-intensity diode laser irradiation is beneficial for the initial stages of alveolar bone healing and for further calcification in both diabetic and normal rats when applied every day at a dose of 13.95 J/cm(2) for 60 s.PMID:21732114[PubMed - in process]

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A randomized clinical trial on the effect of low-level laser therapy on chronic diabetic foot wound healing: a preliminary report.

hotomed Laser Surg. 2011 Feb;29(2):109-14. Epub 2011 Jan 9

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.

PMID:21214368[PubMed - indexed for MEDLINE]

Disorders of tissue transformations of lysophosphatidylcholines at experimental pancreaticdiabetes in white rats and peculiarities of the corrective effect of low-energy laser radiation of an extremely low intensity.

Dokl Biochem Biophys. 2010 Jul-Aug;433:145-7. Epub 2010 Aug 17.Burlakova EB, Karagezyan KG, Amirkhanyan OM, Ovakimyan SS, Sekoyan ES.Emanuel Institute of Biochemical Physics, Russian Academy of Sciences, Moscow, Russia.

PMID:20714843[PubMed - indexed for MEDLINE]

Irradiation at 830 nm stimulates nitric oxide production and inhibits pro-inflammatory cytokines in diabetic wounded fibroblast cells.

Lasers Surg Med. 2010 Aug;42(6):494-502.Houreld NN, Sekhejane PR, Abrahamse H.Laser Research Centre, Faculty of Health Sciences, University of Johannesburg, P.O. Box 17011, Doornfontein 2028, South Africa.

Abstract

BACKGROUND AND OBJECTIVE:

Wound healing in diabetic patients remains a chief problem in the clinical setting and there is a strong need for the development of new, safe, reliable therapies. This study aimed to establish the effect of irradiating diabetic wounded fibroblast cells (WS1) in vitro on pro-inflammatory cytokines and the production of nitric oxide (NO).

MATERIALS AND METHODS:

Normal, wounded and diabetic wounded WS1 cells were exposed to an 830 nm laser with 5 J/cm(2) and incubated for a pre-determined amount of time. Changes in cellular viability, proliferation and apoptosis

were evaluated by the Trypan blue assay, VisionBlue fluorescence assay and caspase 3/7 activity respectively. Changes in cytokines (interleukin--IL-6, IL-1 beta and tumour necrosis factor-alpha, TNF-alpha) were determined by ELISA. NO was determined spectrophotometrically and reactive oxygen species (ROS) was evaluated by immunofluorescent staining.

RESULTS:

Diabetic wounded WS1 cells showed no significant change in viability, a significant increase in proliferation at 24 and 48 hours ($P<0.001$ and $P<0.01$ respectively) and a decrease in apoptosis 24 hours post-irradiation ($P<0.01$). TNF-alpha levels were significantly decreased at both 1 and 24 hours ($P<0.05$), while IL-1 beta was only decreased at 24 hours ($P<0.05$). There was no significant change in IL-6. There was an increase in ROS and NO ($P<0.01$) 15 minutes post-irradiation.

CONCLUSION:

Results show that irradiation of diabetic wounded fibroblast cells at 830 nm with 5 J/cm(2) has a positive effect on wound healing in vitro. There was a decrease in pro-inflammatory cytokines (IL-1 beta and TNF-alpha) and irradiation stimulated the release of ROS and NO due to what appears to be direct photochemical processes.

 PMID:20662026[PubMed - indexed for MEDLINE

[Laser therapy in diabetes mellitus]

[Article in Ukrainian]

Bodnar PM, Peshko AO, Prystupiuk OM, Voronko AA, Kyriienko DV, Mykhal'chyshyn HP, Naumova MI.

Diabetic patients have been shown to derive great benefit from treatment with laser therapy as evidenced by experience gained with its use over many years. Laser therapy promotes compensation, has an antiatherogenic, antioxidant, immunomodulating effects, improves microcirculation, myocardial contractility and performance capability.PMID: 10626465 [PubMed - indexed for MEDLINE]

[Use of infrared laser therapy in patients with ischemic heart disease associated with diabetes mellitus type 2 in health resort]

Vopr Kurortol Fizioter Lech Fiz Kult. 2002 Jul-Aug;(4):9-11

Zin'kovskaia TM, Zavrazhnykh LA, Golubev AD.

Infrared laser therapy (300 Hz) combined with balneotherapy and patients' education is more effective than standard sanatorium rehabilitation in patients with ischemic heart disease associated with diabetes mellitus type 2. 81.8% patients showed good response manifesting in less frequent anginal attacks, episodes of pain and painless ischemia and lower doses of antianginal drugs. Systolic and diastolic arterial pressure lowered by 18 and 10 mm Hg on the average, respectively. Multimodality rehabilitation of IHD patients with type 2 diabetes mellitus improves hemostasis, carbohydrate and lipid metabolism. Coronary circulation response lasted for 24 weeks. PMID: 12380522 [PubMed - indexed for MEDLINE]

[Laser puncture in the treatment of diabetic angiopathies of the lower extremities]

Peshko AA.Laseropuncture in patients with diabetes mellitus associated with angiopathies of the lower extremities (grade II and III) produced a pronounced clinical effect which was manifested by removing the pain

syndrome, improvement of the peripheral circulation and extremity function and function of the lower extremities, improvement of thermographic values. But this positive dynamics was more pronounced in angiopathies of the lower extremities of the stage of functional disorders than obliterating atherosclerosis of the legs. Sterility of the laser beam, possibility of local effect on biologically active points, non-painful procedure, absence of age limits and side effects allow to widely recommend this method for the treatment of Diabetes mellitus associated with angiopathies of the lower extremities.

PMID: 1485457 [PubMed - indexed for MEDLINE]

[Use of physical factors in the complex therapy of patients with diabetic angio- and polyneuropathies of the lower extremities]

[Article in Ukrainian] Shablinskaia NB.

Results are submitted of treatment of 110 patients with diabetes mellitus (61 male and 49 female subjects) presenting with angio- and polyneuropathies of the lower extremities. 70 patients, in addition to a drug therapy, were administered physiotherapeutic treatments, such as amplipulsetherapy, darsonvalization, and laserotherapy. Forty patients received medicamentous therapy only. Based on clinical findings and laboratory methods of investigation expediency has been shown of employment of physiotherapeutic methods in the treatment of the above pathology.

PMID: 12442525 [PubMed - indexed for MEDLINE]

Photobiomodulation improves cutaneous wound healing in an animal model of type II diabetes.

Photomed Laser Surg. 2004 Aug;22(4):281-90.

Byrnes KR, Barna L, Chenault VM, Waynant RW, Ilev IK, Longo L, Miracco C, Johnson B, Anders JJ.

Department of Anatomy, Physiology and Genetics, Uniformed Services University of the Health Sciences, 4301 Jones Bridge Road, Bethesda, MD 20814, USA. krb27@georgetown.edu

OBJECTIVE: We investigated the effects of photobiomodulation (PBM) on cutaneous wound healing in an animal model of type II diabetes, Psammomys obesus (Sand Rats). BACKGROUND DATA: 632-nm light has been established as the most effective wavelength for treatment of cutaneous wounds; however, the inconsistent efficacy of PBM may be due to inadequate treatment parameter selection. METHODS: Using 632-nm light, an initial series of experiments were done to establish optimal treatment parameters for this model. Following creation of bilateral full-thickness skin wounds, non-diabetic Sand Rats were treated with PBM of differing dosages. Wound healing was assessed according to wound closure and histological characteristics of healing. Optimal treatment parameters were then used to treat type II diabetic Sand Rats while a diabetic control group received no irradiation. In order to elucidate the mechanism behind an improvement in wound healing, expression of basic fibroblast growth factor (bFGF) was assessed. RESULTS: Significant improvement in wound healing histology and wound closure were found following treatment with 4 J/cm(2) (16 mW, 250-sec treatments for 4

consecutive days; p < 0.05). The 4 J/cm(2) dosage significantly improved histology and closure of wounds in the diabetic group in comparison to the non-irradiated diabetic group. Quantitative analysis of bFGF expression at 36 h post-injury revealed a threefold increase in the diabetic and non-diabetic Sand Rats after PBM. CONCLUSIONS: The results demonstrate that PBM at an energy density of 4 J/cm(2) is effective in improving the healing of cutaneous wounds in an animal model of type II diabetes, suggesting that PBM (632 nm, 4 J/cm(2)) would be effective in treating chronic cutaneous wounds in diabetic patients. PMID: 15345169 [PubMed - indexed for MEDLINE]

Vascular endothelial growth factor in ocular fluid of patients with diabetic retinopathy and other retinal disorders.

Aiello LP, Avery RL, Arrigg PG, Keyt BA, Jampel HD, Shah ST, Pasquale LR, Thieme H, Iwamoto MA, Park JE, et al. Comment in: N Engl J Med. 1994 Dec 1;331(22):1519-20. N Engl J Med. 1994 Dec 1;331(22):1480-7.

Department of Ophthalmology, Beetham Eye Institute, Joslin Diabetes Center, Boston, MA 02215.

BACKGROUND. Retinal ischemia induces intraocular neovascularization, which often leads to glaucoma, vitreous hemorrhage, and retinal detachment, presumably by stimulating the release of angiogenic molecules. Vascular endothelial growth factor (VEGF) is an endothelial-cell-specific angiogenic factor whose production is increased by hypoxia. METHODS. We measured the concentration of VEGF in 210 specimens of ocular fluid obtained from 164 patients undergoing intraocular surgery, using both radioimmuno-assays and radioreceptor assays. Vitreous proliferative potential was measured with in vitro assays of the growth of retinal endothelial cells and with VEGF-neutralizing antibody. RESULTS. VEGF was detected in 69 of 136 ocular-fluid samples from patients with diabetic retinopathy, 29 of 38 samples from patients with neovascularization of the iris, and 3 of 4 samples from patients with ischemic occlusion of the central retinal vein, as compared with 2 of 31 samples from patients with no neovascular disorders (P < 0.001, P < 0.001, and P = 0.006, respectively). The mean (+/- SD) VEGF concentration in 70 samples of ocular fluid from patients with active proliferative diabetic retinopathy (3.6 +/- 6.3 ng per milliliter) was higher than that in 25 samples from patients with nonproliferative diabetic retinopathy (0.1 +/- 0.1 ng per milliliter, P = 0.008), 41 samples from patients with quiescent proliferative diabetic retinopathy (0.2 +/- 0.6 ng per milliliter, P < 0.001), or 31 samples from nondiabetic patients (0.1 +/- 0.2 ng per milliliter, P = 0.003). Concentrations of VEGF in vitreous fluid (8.8 +/- 9.9 ng per milliliter) were higher than those in aqueous fluid (5.6 +/- 8.6 ng per milliliter, P = 0.033) in all 10 pairs of samples obtained simultaneously from the same patient; VEGF concentrations in vitreous fluid declined after successful laser photocoagulation. VEGF stimulated the growth of retinal endothelial cells in vitro, as did vitreous fluid containing measurable VEGF. Stimulation was inhibited by VEGF-neutralizing antibodies. CONCLUSIONS. Our data suggest that VEGF plays a major part in mediating active intraocular neovascularization in patients with ischemic retinal diseases, such as diabetic retinopathy and retinal-vein occlusion.PMID: 7526212 [PubMed - indexed for MEDLINE]

Blood-retina barrier permeability and its relation to the progression of diabetic retinopathy in type 1 diabetics. An 8-year follow-up study.

Engler C, **Krogsaa B**, **Lund-Andersen H**. Graefes Arch Clin Exp Ophthalmol. 1991;229(5):442-6.
Hvidore Hospital, Klampenborg, Denmark.

Blood-retina barrier (BRB) permeability and its relation to the progression of diabetic retinopathy was studied over an 8-year period in 50 insulin-dependent diabetic patients. Initially, the patients underwent an ophthalmological examination, including measurement of best corrected visual acuity, fundus photography and vitreous fluorometry for determination of BRB permeability. After 8 years the patients were reexamined and their retinal status and clinical course were evaluated. We found a positive correlation between a high initial permeability value and an unfavorable clinical course using the parameter photocoagulation. A decrease in follow-up visual acuity was also associated with high initial permeability; however, this correlation was not statistically significant. A significant difference in mean blood pressure was found between values measured in laser-treated patients vs a group that did not undergo such therapy. Thus, in patients showing the same initial retinal morphology, high permeability seems to indicate an unfavorable disease course. The extent to which BRB permeability can be a valuable supplement to fluorescein angiography and three-mirror examination in the clinical decision process needs to be further evaluated.
PMID: 1937077 [PubMed - indexed for MEDLINE]

Blood flow in the skin of the foot related to posture in diabetes mellitus.

Rayman G, **Hassan A**, **Tooke JE**. Br Med J (Clin Res Ed). 1986 Jan 11;292(6513):87-90.
Normal healthy subjects show a reflex rise in precapillary resistance in the skin of the foot when they rise from lying to standing. To investigate the integrity of this reflex in patients with diabetes mellitus blood flow in the plantar region of the big toe was measured, using a laser Doppler flowmeter. The responses of diabetic patients with and without peripheral sensory neuropathy and healthy control subjects matched for age and sex were studied, with the foot at heart level and the foot passively lowered to 50 cm below the heart. In normal subjects mean blood flow recorded during the third to fourth minute of dependency fell to 18.1 (SD 11.9)% of the preceding resting flow determined with the foot at heart level. In the diabetic patients without neuropathy blood flow fell to 28.9 (18.6)% of the preceding resting flow. In the diabetic patients with neuropathy blood flow fell to 53.5 (23.7)% of the preceding resting flow, which was significantly different from the value achieved by the diabetics without neuropathy (p less than 0.02) and the healthy controls (p less than 0.002). Six normal subjects were indirectly heated to release sympathetic tone and achieve the same mean skin temperature of the foot as the diabetic patients with neuropathy, and blood flow fell to 38.7 (24.3)% of the preceding resting flow, a value not significantly different from the response seen in the patients with neuropathy. These findings suggest that the postural control of blood flow in the foot is disturbed in patients with diabetic neuropathy, and this disturbance is compatible with a loss of sympathetic vascular tone. The resultant hyperperfusion on dependency may account for the oedema seen in some patients with neuropathy and may also act as a stimulus for the thickening of capillary basement membranes.
PMID: 3080102 [PubMed - indexed for MEDLINE]

Risk factors for diabetic retinopathy in youth. Pediatrics. 1984 Jun;73(6):756-61.

Malone JI, **Grizzard S**, **Espinoza LR**, **Achenbach KE**, **Van Cader TC**.

Retinal microvascular abnormalities were evaluated in 74 insulin-dependent diabetic youths by fluorescein angiography on two or more occasions spanning at least 4 years. Half of this group showed progression of the retinal vascular abnormalities from a stage of no significant abnormalities to at least background retinopathy with more than ten microaneurysms. Proliferative retinopathy requiring laser photocoagulation occurred in 14% (10/74). Insulin administration (once or twice a day) and glycemic control as reflected by hemoglobin A1C were identical in those with progression and in those with no progression of retinopathy. More females than males in this age group developed progressive retinopathy (P less than .036). Human lymphocyte antigen (HLA) types DR3 and DR4 in combination occurred more frequently (P less than .001) in those with progression of retinopathy than in those without progression. Teenaged , female, insulin-dependent diabetics with both HLA DR3, and DR4, were at increased risk for developing proliferative retinopathy.

PMID: 6610167 [PubMed - indexed for MEDLINE]

[The medical effect of magnetic-laser therapy in patients with diabetic angiopathies of the lower extremities][Article in Ukrainian] Lik Sprava. 1996 Oct-Dec;(10-12):155-8.

Shved MI, **Dudnik AP**.

Conventional antidiabetic therapy with insulin and sugar-lowering agents helps in achieving compensation of diabetes mellitus but fails to exert high effect on subjective and objective manifestations of diabetic microangiopathies of the lower extremities. A course of magnetic-laser therapy results in significant reduction of concentration of the lipid oxidation products as one of the pathogenetic mechanisms of diabetic microangiopathies, normalization of immunologic reactivity as well as attenuation of clinical manifestations of hemocirculatory disorders in the lower extremities and improvement of parameters of thermo- and rheovasography.

PMID: 9138797 [PubMed - indexed for MEDLINE]

[Infrared laser therapy in distal diabetic polyneuropathy]

[Article in Russian]**Kalinina OV**, **Alekseeva NV**, **Burtsev EM**. Zh Nevrol Psikhiatr Im S S Korsakova. 1998;98(6):23-5.

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. Application of laser irradiation of low intensiveness was effective while in combined therapy of distal diabetic polyneuropathy as well as monotherapy.PMID: 9677693 [PubMed - indexed for MEDLINE]

[Phase treatment of suppurative wounds using ultrasonics and laser irradiation in patients with diabetes mellitus][Article in Russian] Klin Khir. 1992;(1):6-8.
Kuliev RA, **Babaev RF**.

A result of treatment of 112 patients with diabetes mellitus and purulent surgical diseases has been analysed. In the complex of treatment, a low-frequency ultrasound and laser radiation were employed. An advantage of the use of ultrasound at the first, and laser--at the second phase of a wound process was noted. Phasic use of ultrasound and laser accelerates the course of a wound process, contributes to shortening the duration of treatment.
PMID: 1564879 [PubMed - indexed for MEDLINE]

[The effect of the laser irradiation of the blood on its lipid and phospholipid components in diabetes mellitus][Article in Russian] Voen Med Zh. 1998 Oct;319(10):37-8, 95.
Lebed'kov EV, **Tolstykh PI**, **Marchenko LF**, **Turkina TI**, **Krivikhin VT**.

Study results of the laser irradiation impact on the blood lipid and phospholipid components and membrane erythrocyte in patients with diabetes mellitus and pyo-necrotic injuries of lower extremities when treated by laser intravenously or epicutaneously. The results prove, that the laser irradiation of low intensity favourably affects the blood components in a complex treatment of diabetes mellitus. Intravenous irradiation positive dynamics are more easily observed.
PMID: 9849086 [PubMed - indexed for MEDLINE]

[Use of infrared laser therapy in patients with ischemic heart disease associated with diabetes mellitus type 2 in health resort][Article in Russian]
Zin'kovskaia TM, **Zavrazhnykh LA**, **Golubev AD**. Vopr Kurortol Fizioter Lech Fiz Kult. 2002 Jul-Aug;(4):9-11.
Infrared laser therapy (300 Hz) combined with balneotherapy and patients' education is more effective than standard sanatorium rehabilitation in patients with ischemic heart disease associated with diabetes mellitus type 2. 81.8% patients showed good response manifesting in less frequent anginal attacks, episodes of pain and painless ischemia and lower doses of antianginal drugs. Systolic and diastolic arterial pressure lowered by 18 and 10 mm Hg on the average, respectively. Multimodality rehabilitation of IHD patients with type 2 diabetes mellitus improves hemostasis, carbohydrate and lipid metabolism. Coronary circulation response lasted for 24 weeks. PMID: 12380522 [PubMed - indexed for MEDLINE]

[The use of helium-neon laser radiation in the treatment of trophic disorders in patients with diabetes mellitus][Article in Russian] Klin Khir. 1992;(3):47-9.**Zubkova ST**.
The effectiveness of laser therapy in trophic skin disorders (ulcer, diabetic bulla, hematoma, skin chap) in patients with diabetes mellitus was studied. The foci of trophic disorders and biologically active points were irradiated by means of heliumneon laser installations. The technique was employed in a hospital and in out-patient treatment in the complex with medicamentous therapy and without that in patients resistant to

medicamentous therapy. A high effectiveness of laser therapy has been established.
PMID: 1619869 [PubMed - indexed for MEDLINE]

[Magnetolaserotherapy in correction of metabolic disorders in patients with diabetes mellitus (guide for physicians)]

Vopr Kurortol Fizioter Lech Fiz Kult. 2005 Sep-Oct;(5):45-6.
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Turova EA, **Minenkov AA**, **Teniaeva EA**, **Golovach AV**, **Shokhina LIa**, **Kul'chitskaia DB**, **Artikulova IN**, **Saakian ZhM**; **The Russian Ministry of Public Health. The Russian Scientific Center for Rehabilitation and Health Resort Medicine**.
ication Types: Practice GuidelinePMID: 16318009 [PubMed - indexed for MEDLINE

BIORESONANCE INFORMATION LASER THERAPY OF DIABETES MELLITUS A FIRST CLINICAL EXPERIENCE OF THE HYPOGLYCEMIC EFFECT OF LOW-LEVEL LASER THERAPY AND ITS PERSPECTIVES

Work first presented at North American Laser Therapy Association Conference, Rockville, Washington D.C., October, 1999"Treated To Live A Normal Life Without Exogenous Insulin Or Hypoglycemic Tablets ,"DR. PRETIDEV RAMDAWON M.D., Ph.D., D.Sc. Associate Professor of MedicineDIRECTOR, CENTRE OF LIGHT MEDICINE INTERNATIONAL ACADEMY OF LIGHT MEDICINE197, avenue des Flamants, Morc. Safeland,

INTRODUCTION

Diabetes Mellitus is an extremely devastating disease that gives many serious complications and its definite cure has not been known since it has ever been nosologically classified. In order to have an idea about its propagation around the world, we find that only in the USA, approximately 16 million people are currently suffering from diabetes mellitus. Of these 16 millions, approximately one million have Type I diabetes, 7 millions are diagnosed with Type II diabetes, and 8 millions have Type II diabetes but have not been diagnosed with the disease [1]. Diabetes Mellitus and its complications consume 15 % of the annual U.S. healthcare budget, thus showing its extreme seriousness and costliness. According to the Juvenile Diabetes Foundation, "scientists predict a worldwide diabetes epidemic: by the year 2 010, they estimate that 220 million people will suffer from diabetes mellitus, which is more than double the number affected today" [2]. The number of Americans with diabetes has increased nearly by 700 % in the last 40 years, leading the Centers of Disease Control and Prevention to call it the "epidemic of our time" [2]. Left untreated, diabetes can bring about life-threatening complications, such as blindness, kidney disease, nerve damages, heart disease, cerebral stroke, etc. [3]. Understanding the severity of the tenacious human struggle against this "sweet" problem, NASA has rightly joined the fight against diabetes mellitus. It is growing human insulin crystals on Space Shuttle missions to a quality that has not been achieved on Earth. It has been proclaimed that X-ray defraction crystallization has provided a more precise structural view of

insulin molecules that could lead to new insulin therapies through an improved control over the effective rate of release of insulin into the blood stream. NASA does not have a diabetes research program, but it is conducting research that could have an impact on the fight against diabetes [4]. However, the production of some new "spatial" kind of insulin does not seem to promise the liberation of the human race from diabetes. Introducing this new insulin or any other one into the sick human body will definitely not free the person from diabetes mellitus because of a lack of consideration of the etio-pathogenetic causes involved in the manifestation of this disease. Instead, we have to find out methods that will act on the human organism so as to change cellular, tissue, organ and systemic functioning in such a way that the blood sugar level be restored to its normal values and complications due to diabetes mellitus disappear. This is possible today, not with pharmacological preparations, like hypoglycemic injections or tablets, but with bioresonance information quantum methods that can remind the human body of the lost information (due to the development of pathology) needed to function properly, and further supply the energy required for the energy-depleted organism to restore its physiological functions to their normal values and thus eradicate disease.

AIM OF THE STUDY

Following the etio-pathogenetic approach in the therapeutic management of any pathological process, and being armed with the latest information and practical experience in the newly-developing and very promising field of bioresonance information laser medicine, thereby arose the obvious aim to elaborate a highly effective method of treatment for insulin-dependent diabetes (IDD) or Type I diabetes and non-insulin-dependent diabetes (NIDD) or Type II diabetes with the application of bioresonance information laser method of treatment, which involves the complex integrative use of low-level laser irradiation (LLLI), microwave resonance puncture (MRP) and light-emitting diode chromatotherapy (LEDCT) that would free diabetic patients from life-long insulin injections or hypoglycemic tablets and enable them to lead a normal life with a normal or not severely restrained diet.

REVIEW AND THEORY

Surgical and chemotherapeutical methods of treatment have shown themselves to be not fully effective in eradicating the "sugar" disease. Laser medicine, being one of the main fields of quantum medicine, is constantly showing its growing effective-ness in treating diseases from practically all fields of medicine. Low-level laser therapy (LLLT) has been initially developed in order to supply with energy the sick human organism so that the latter could fight back disease. However, some time later, the "resonance absorption phenomenon" was discovered during the application of LLLT [5, 6, 7, 8] as well as MRT [15]. The "resonance absorption phenomenon" has been developed as a conceptual approach for direct influence on the organism at the atomo-molecular level since the early days of LLLT application (T. Karu, 1989). Some evidences have been found in advantage of this model of laser therapy:
1. "In vitro" experiments with quantitative spectroscopic investigations have shown the "resonance character" of low-energy laser irradiation on various cells, depending upon the

wavelength, dosage and power density of irradiation. For red and near infrared spectral ranges, the biostimulating effect is realized at the molecular level (V.A. Grimblatov, A.A. Losev, 1989). 2. In spite of the diversity of therapeutic effects of low-energy laser bio-activation, most of them are of a secondary nature. For example, the neuro-reflectory changes (changes in the psycho-physiological condition of the human being, functional activity of the central and peripheral nervous system, etc.) as reactions to laser therapy are secondary effects, which are caused by intra-cellular metabolic changes (A.S. Kryuk et al., 1986). Endocrine reactions are also secondary in nature as laser therapy does not apparently cause the direct photo-activation of hormones [8, 9, 10].

LLLT can be performed in the form of bioresonance information laser therapy as it is, first of all, giving no harmful side-effects, and secondly, it can be modulated into a proper form of highly effective therapy used to eliminate pathological vibrations in any part of the human body as well as strengthen the healthy ones. As any pathological process starts in cells, tissues, organs or systems upon loss of memory from the corresponding bio-structures and consecutive development of disorders in the range of their oscillations which are biophysical manifestations of their normal metabolic processes. Therefore, it would be essential to normalize the range of oscillations that would help restore the memory apparatus of sub-cellular, cellular and more composite bio-structures, and consequently, their metabolism to normal values. In order to achieve such results in therapy, it is primordial to select those frequency parameters of LLLI that would be close or similar to the frequencies of the oscillatory processes of non-affected cells, tissues, organs or systems. Thus, a "bioresonance effect" is caused to occur in the previously altered functional system of an organ with a characteristic range of frequencies for itself due to the therapeutically acting frequencies of LLLI. Obviously, such a coincidence of frequency characteristics causing the bioresonance effect will lead to an accelerated restoration of physiological functions, and later, of structures of the affected organs if these have not still entered into any irreversible process.

Bioresonance information laser therapy can be carried out in various ways, e.g. laserpuncture, chakra (energy center) laser therapy, transcutaneous, transorganic, intracavitary, intravenous and other methods of influence. The laser beam, consisting of red and infrared laser rays, is modulated into a bioresonance form, which is normally achieved by irradiating the laser beam at a variable impulse regimen starting from 1 Hz to normally not more than 1000 Hz, depending upon the targeted results. The key element in the bio-activating effect of LLLT is the activation of enzymes, leading to an intensification of bio-energetic and biosynthetic processes in cells [11, 12, 13, 14]. The activation of bio-energetic enzymes leads to an increase in the level of adenosine triphosphate (ATP) and other biologically active substances. Accordingly, the time-period of the main enzymatic processes does not exceed 10-3 - 10-2 sec. Therefore, the minimal interval between impulses of laser irradiation should not be less than 10-3 sec, which corresponds to the frequency range not exceeding 1000 Hz so as not to interfere with the already started enzymatic reactions [6, 7].

Therefore, LLLT, MRT and LEDCT was performed in a group of diabetic patients of varying age

in order to confirm the results and expectations of earlier experimentations in the fields of diabetology and quantum medicine. The results of our experimental and clinical studies in these fields of medicine as well as pathologic anatomy and physiology have led us to believe that any disease is reversible, depending upon the functional level and the extent of organic damage of the concerned organ(s) or system(s)

PROCEDURES

Diabetes mellitus was successfully treated with the use of low-energy laser in 60 clinical cases, with children from the age of 3.5 years till 15 years of age, adolescents and adults with a maximal age of 76 years. The average age of the patients was 45.5 years. Control groups of patients consisted of 3 patients for each age group.
Helium-Neon (630 nm), LED Red (630-750 nm), and laser and LED infrared (850, 860-960 nm) low-energy quantum beams were applied simultaneously (separately on different zones or in combination on the same areas) or separately at different times on different parts of the body. LLLT and LEDCT were performed transorganally, intravenously, transcutaneously in reflex zones and upon acupuncture points (laser-puncture) with the help of Russian-made quantum therapy apparatuses "MILTA", "RIQTA", "MILTA-KVTch", "AZOR", and "ADEPT".
In fact, LLLT formed part of a complex, but synergistic method of treatment, which is actually known as magneto-infrared-laser therapy (MILT). This form of therapy involves the influence of a constant magnetic field and LED red and infrared light irradiation, which help the infrared laser irradiation to attain penetration depths of 10 to 13 cm in the bio-tissues. This penetrative ability of the LLLI in the tissues through a complex but synergistically acting quanto-magnetic field assures the success of application of the treatment method for such internal organs as the liver and pancreas, which are directly responsible for the development and manifestation of diabetes mellitus.

Apart from MILT, other bioresonance information energy methods of treatment, such as MRT and MRT combined with LEDCT were also applied. The combined application of MRT and LEDCT was realized with the help of the "Polyfactor Apparatus for Quantum Therapy", known as "PAQT-02L" and manufactured in Russia by the Human Information Technologies Design and Production State Enterprise MILTA "PKP GIT", which is the conversion filial of the world-famous Russian State Cosmic Industry. However, LLLT has been aimed as the major form of treatment in this complex therapeutical approach, where LEDCT and MRT were applied as complementary, but useful and energo-harmonizing methods of therapy.

Control tests of the blood sugar level were done before and after each session of such multifactorial therapy. Energo-functional control of the concerned organs and systems before, during and after the treatment courses was effected with the help of computerized electro-meridian scanning (CEMS) or electro-acupuncture method according to Dr. R. Voll (EAV).

Treatment was essentially carried out in the morning during a fasting regimen of the patients. Moreover, morning sessions of MILT, MRT and LEDCT as well as other forms of energy therapy

are more effective and cause a harmonizing influence on the central and vegetative nervous systems of the human organism, apparently being more compatible with biorhythmic changes in the body.

The period of treatment was from two weeks till 3 months, and in persistent cases, it was prolonged till 4-5 months, and in an isolated case till 7 months. The average number of laser treatment sessions was between 9 and 36 in the majority of cases, and in persistent ones - between 40 and 80 in all. The number of laser and combined quantum treatment sessions, amounting to more than 15 or 20, were broken down into treatment courses with an interval of not less than one month in between.

RESULTS

Amongst those patients who used hypoglycemic tablets, there were 2 adolescents and 18 adults with no children in this subgroup, whereas amongst those using actraphane insulin, there were 5 children, 6 adolescents and 29 adults.

All patients, using actraphane insulin or hypoglycemic tablets, could stop all their anti-diabetic medications by the 6th. week of laser treatment.

As a rule, significant falls by 50 till 200 mg/100 ml (average being 160 mg/100 ml) in the blood sugar level were observed after each session of laser and combined treatment in 98.46 % of cases, except for those extreme cases of diabetes where the hyperglycemic level persisted after the treatment session in 1.54 % of cases. However, in later treatment courses, these resistant patients also reacted positively to their treatment after having crossed a certain threshold value, and finally attained recovery.

Complications due to diabetes, such as various pain syndromes, diabetic cardio-myopathy, nephropathy, neuropathy, diabetic foot with ulcers and angiopathic changes as well as obesity disappeared practically completely and even impaired erectile function was restored up to the male patient's satisfaction and surprise. It should be noted that in three cases where surgical intervention in the form of plastic surgery for skin grafting was performed for the treatment of diabetic foot ulcers, no satisfactory results were obtained. However, treatment with MILT, MRT and LEDCT during a period of 3 to 6 weeks resulted into complete recovery of the diabetic ulcers with full soft tissue regeneration and restoration of local blood circulation.

In all cases, independent of the type of diabetes, where the patients observed all the recommendations given to them, the blood sugar level was normalized completely, and the patients don't need any more insulin or hypoglycemic tablets. More than 60 % of them could return to a normal alimentary regimen, eating and drinking sweet products in reasonable amounts. The rest (40 %) of the patients had to observe certain diet restrictions, but they did not have to take any medications for maintaining a normal life.

In all 9 control patients who underwent the complex treatment for diabetes mellitus, there was no apparent side effect. Though the blood sugar level was initially within the normal range (60-120 mg/100 ml) for these control patients, a normalizing and stabilizing effect of quantum therapy upon the blood sugar level was noted. The blood sugar level had the tendency to go and stabilize in the range of 60 to 90 mg/100 ml. Moreover, an improvement in general health condition as well as in digestive processes was observed in these control patients. In four of them, unstability of gastro-intestinal functions, including consti-pation and flatulence, disappeared upon administration of laser treatment.

FOLLOW-UP

It is true that the follow-up is only a short-term one, i.e. for a period of not more than seven years in all. In any case, neither a recurrence of pathological hyperglycemia nor another apparent manifestation of diabetes mellitus has been reported in any of the patients treated by the method of bioresonance information laser therapy.

CONCLUSIONS

The first most important conclusion made during this clinical study is that even in advanced cases of diabetes mellitus, the pancreas retains its ability to restore the functional possibilities of its tissues as well as their regeneration, specifically the insulin-producing β-cells of the Islets of Langerhans. Otherwise, without the functional restoration and structural regeneration of these islet cells, it would have been impossible to bring down the blood glucose level to normal values without the use of any hypoglycemic medications. It should be well noted that the common thought, that it is impossible for the pancreas to restore its function and morphology in case of diabetes mellitus, has definitely come to an end in the history of this disease and mankind.

Secondly, it has been ascertained from this study that the quantum energy of laser rays is capable of stimulating and causing the regeneration of pancreatic tissues, including the β-cells of the Islets of Langerhans, even in advanced disease states.

Thirdly, the "resonance phenomenon" of the bioresonance information laser therapy method is effective in "reminding" the pancreas of its normal oscillatory functional obligations, which are essential in eliminating disease (diabetes mellitus) and restoring its normal physiological function and structural configuration to the maximum of the reversibility of the pathological process.

Fourthly, the bioresonance information laser therapy method is effective in treating diabetes mellitus at all its stages, except for terminal stages when structural and functional pathological changes acquire an irreversible character.

Fifthly, this complex bioresonance information laser method of treatment, with the central application of low-energy laser irradiation, gives much better results than those obtained till now

with the help of surgical methods (transplantation of the pancreas β-cells) or therapeutical ones (use of hypoglycemic agents - tablets or exogenous insulin injections).

Sixthly, this bioresonance method of laser therapy can be used in combination with therapeutic or surgical methods of treatment, especially with or after transplantation of the pancreas cells in order to improve the results of treatment of diabetes mellitus in medical centres, which have institutionalized such methods as the transplantation of the pancreatic β-cells.

Seventhly, this complex, but integrative method of treatment of diabetes mellitus shows its advantages in comparison to other till-now existing methods of treatment, which are its absence of any harmful side-effects, non-invasiveness, its higher efficacy and its significantly lower costs.

Eighthly, the ability to cure both insulin-dependent diabetes (IDD) and non-insulin-dependent diabetes (NIDD) makes bio-resonance information laser therapy an outstanding and revolutionary method of treatment, unequalled in time and action, and symbolizing a promising step forward into the new millennium for the whole humanity.

Finally, the bioresonance information laser therapy method of diabetes mellitus represents a major "break-through" in diabetology, as it is the first therapeutic technique known today to have provided a genuine and scientifically-based complete cure of this devastating disease.

PRACTICAL AND SCIENTIFIC RECOMMENDATIONS

The bioresonance information laser method of treatment of diabetes mellitus is recommended for wide application in the treatment of diabetic patients suffering from insulin-dependent (Type I) and non-insulin dependent (Type II) forms of the disease at its various stages.
This method is further recommended for the treatment of diabetic patients suffering from various diabetic complications.

The laser quantum method of treatment of diabetes mellitus can be safely and effectively used to treat diabetic patients suffering parallelly from diseases of other systems, e.g. cardiovascular, renal, nervous, musculo-skeletal, etc.

The strong scientific belief prevails here that the further development and perfection of this highly effective and completely secure method of bioresonance laser quantum therapy of diabetes mellitus will bring us to better results of treatment in a relatively shorter time-period amongst the world-wide existing many millions of diabetics. Therefore, further well-targeted experimental and clinical investigations should be intensively carried out in this unique field of quantum diabetology for the sake of the present and future generations of mankind and the creation of a diabetes-free world.

LIST OF WORKS:

1. A First Clinical Experience In The Application Of Quantum Laser Therapy For Diabetes Mellitus: Treated To Live A Normal Life Without Exogenous Insulin Or Hypoglycemic Tablets, North American Laser Therapy Association Conference, Rockville, Washington D.C., October, 1999.

2. Quantum Laser Therapy Of Diabetes Mellitus: A First Clinical Experience - Treated To Live A Normal Life Without Exogenous Insulin Or Hypoglycemic Tablets, Sixth International Scientific & Practitioner's Conference on Quantum Medicine, Moscow, December, 1999. (Awarded the First Prize for the best scientific report of the conference).

3. Endocrinology - Practical Recommendations For Application: Magneto-Infrared-Laser Therapy (MILTA) Apparatus For Quantum Medicine, Humanitarian Information Technologies Design & Production Enterprise, Moscow, 2000.

4. Basics of Laserpuncture and Laser Reflexotherapy: Methods of Irradiation in Laser Therapy. Influence Zones in Laserpuncture and Reflexotherapy. Acupuncture Points and Micro-Acupuncture Zones. Frequency Parameters of Low-Level Laser Irradiation in Laserpuncture and Reflexotherapy. The Normalizing Effect of LLLT in Hypo- and Hyperfunction. The Systemic Approach to Low-Level Laser Therapy. Medical Acupuncture and Laser Congress. 28-30.09.2000. Helsinki, Finland.

5. Fundamentals of Quantum Medicine: Essential Principles of Multi-Factorial Magneto-Infrared-Laser (MIL) Therapy. Physical Principles of MIL-Therapy. Biological Principles of MIL-Therapy. The Resonance Phenomenon and The Information Apparatus of Cells Used As A Basis For Quantum Therapy. Medical Acupuncture and Laser Congress. 28-30.09.2000. Helsinki, Finland.

6. Bioresonance Information Quantum Therapy of Diabetes Mellitus: A First Clinical Experience - "Treated To Live A Normal Life Without Exogenous Insulin Or Hypoglycemic Tablets". Medical Acupuncture and Laser Congress. 28-30.09.2000. Helsinki, Finland.

7. Bioresonance Information Quantum Laser Therapy of Diabetes Mellitus. 16th International Congress on Laser Medicine, Laser Florence 2001, International Academy for Laser Medicine and Surgery, November 07-11, 2001, Florence, Italy.

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Healing Light-Laser Technology Now Making Strides in Wound Care

Pauline Lathram **November 2001**

The use of lasers in surgery and to treat diabetic retinopathy is well known. A different type of laser, low-level laser therapy (LLLT), is now making news in medical circles.

Unlike high-power lasers that use heat and destroy tissue, low-energy (cold) lasers (through infrared, red and helium-neon (HeNe) light emissions from diodes) affect the cellular energy of the underlying tissue.

"LLLT promotes healing in many conditions because it penetrates the skin, in-creases ATP [adenosine triphosphate] and activates enzymes in the targeted cells," says Andreas Schindl, MD, PhD, Austrian laser researcher.

Different wavelengths are used for different conditions, and are sometimes used in combination. The intensity and length of application of the laser may also vary. Using the incorrect protocol for the specific ailment may result in the treatment having little or no efficacy.

Benefits of LLLT Treatment

When Val Volkov, MD, president of the New Zealand Laser Therapy Association, was asked about the uses of LLLT for diabetes, he responded without hesitation.

"My father had diabetic gangrene while living in Uzbekistan, and my application of LLLT saved his life."

This wouldn't surprise Schindl, who states that clinical experience and published research support the use of LLLT in diabetes for ulcerations, neuropathy and bone conditions. He describes a hospitalized diabetes patient with an ulcerous lesion on his toe that was complicated by edema, advanced infection and osteomyelitis. After the patient was given antibiotics and 16 laser treatments, the ulcer completely healed.

Schindl states in a September 1999 issue of Dermatology that because LLLT has been used successfully in various disorders of microcirculation, it should be considered as an alternative therapy prior to surgery in patients with diabetic gangrene.
"There are no known side effects and it may be used concurrently with any other therapy," he says.

A double-blind study on humans with diabetic ulcerations should be completed in Vienna by December.

LLLT was used concurrently with topical hyperbaric oxygen in an Israeli study of 100 consecutive diabetic foot-ulcer patients who had not responded to prior therapies. According to the March 2001 issue of Yale Journal of Biology and Medicine, 81 percent were healed in an average of three months.

Although LLLT can work remarkably well for diabetic ulcers, Dr. Les Johnson, a podiatrist from New Zealand, cautions, "LLLT is no panacea. One patient may respond dramatically, and another not at all." Yet, when the public health service would not allow him to recover the cost of a laser, Dr. Johnson had no trouble persuading a local support group, Diabetes Wairarapa, to raise grant money to fund the device.

Laser Acupuncture

Published studies show that LLLT is often used on both acupuncture and trigger points. According to a August 1996 issue of Journal of Clinical Laser Medical Surgery, a Swiss laser center applied LLLT on trigger points and observed that the effect on shoulder and arm pain, as well as other conditions, exceeded expectations. Improvements occurred in both microcirculation and the oxygen supply to the trigger-point areas.
In addition, a study in the February 1999 edition of the Journal of Alternative and Complimentary Medicine concludes that when a combination of low-level laser acupuncture and transcutaneous electrical nerve stimulation (TENS) was used in the treatment of carpal tunnel syndrome, it reduced pain by more than 50 percent in 33 of 36 hands, including 14 that had failed to respond to surgery.
Laser acupuncture was also used in diabetic patients with angiopathies of the lower extremities. Among the results were pain reduction, increases in peripheral circulation and better functioning, according to Lik Sprava in October 1992.

Intravenous Laser Irradiation

Journal articles written in Russian publications report success using intravenous laser treatment, an

invasive procedure that treats the blood directly with laser light. A study appearing in the January 1999 issue of Vestnik Oftalmologii reports that diabetic retinopathy was reportedly effectively treated by intravenous laser irradiation and heparin inhalations.

In another study that appeared in the October 1998 issue of Voenno-Meditsinskii Zhurnal, non-invasive LLLT and intravenous infrared laser therapy were each found to improve blood lipids in people with diabetes, although the latter had the greater effect.

Organizations

Clinical use of laser therapy often outpaces techniques reported in published journals, as practitioners are working out protocols for each condition and expanding the number of ailments effectively treated. Meetings of laser researchers and practitioners offer an opportunity for participants to exchange information on new techniques and present papers on various related topics.

In the United States, the American Society for Laser Medicine and Surgery (ASLMA) is an organization that encompasses the use of all types of medical lasers, in contrast, the North American Association for Laser Therapy (NAALT) focuses specifically on LLLT. A number of different professions are represented in NAALT, including physicians, physical therapists, scientists, chiropractors, acupuncturists, nurses and veterinarians. FDA approval in the United States is one of the stated objectives of NAALT.

Worldwide organizations also flourish, and some have recently splintered into different factions. At Laser Florence, an international trade fair and medical congress scheduled to take place in November, organizers are planning a four-hour course of particular interest to those in the diabetes community. Petridev Ramdawon, MD, of Mauritius will present the course on "Laser Diabetology." Dr. Ramdawon will teach the use of LLLT and other quantum techniques for type 1 and 2 diabetes, which produce a long-lasting hypoglycemic effect.

Noting the appropriateness of the setting for the conference, Leonardo Longo, MD, president of Laser Florence, states, "The use of the laser in medicine, surgery and the human sciences is a Renaissance, of sorts, in medical treatment."

Note: In the United States, the FDA has not yet approved low-level laser therapy for general use, although it is classified as a "non-significant risk device." Practitioners may apply for permission to use it for investigative purposes. Most published studies on humans have been done outside the USA. Intravenous LLLT therapy is not generally available in most western countries.

Pauline Lathram, a freelance writer, lives in Memphis, Tennessee. She is interested in innovative medical treatments. Her daughter has type 1 diabetes.