pain improvement, on the contrary, it increased in intensity and its frequency became daily. A photobiomodulation protocol was then initiated focusing on analgesia.
Objective: To demonstrate the efficacy of analgesic treatment in a relevant and disabling clinical complaint despite oral analgesia. Photobiomodulation showed no alteration in shunt functioning based on clinical examination.
Material And Method: A 38-year-old patient underwent photobiomodulation using a low level laser device, radiating points along the pathway from the cervical region to the right abdomen , red light, λ = 660nm, P = 25mW, I = 1W / cm^2, E = 100mJ, H = 4J / cm^2, t = 4s per point being 2cm equidistant points, totaling 30 irradiated points. It was also used the visual analog scale for pain assessment in each subsequent photobiomodulation session.
Results: Immediately after the first session, the patient reported significant improvement, especially of the cervical region. During the treatment with photobiomodulation and, through the analogue visual pain scale analysis and total decrease of opioid use, the patient presented improvement of over 90%.
Discussion and Conclusion: Photobiomodulation had a very effective analgesic effect on pathology unpublished in medical literature.

PHOTOBIOMODULATION THERAPY AND ITS PLACE IN MEDICINE OF THE 21st CENTURY

Anatolii Korobov, PhD

V.N.Karazin Kharkiv National University, Radio physicist ,Kharkiv, Ukraine

In 2012, the head of the World Health Organization, Margaret Chan, said that medicine, as we know it, came to an end—antibiotics do not work.
But antibiotics do not work, mainly because they are not delivered to the pathology zone in the required quantity due to the presence of lymphocytic shaft. Lymphocytic shaft can be overcome with the help of light, restoring microcirculation in the area of pathology.
It is possible to increase the effectiveness of substitution pharmacotherapy only by including photobiomodulation therapy in the therapeutic process.
Since all the processes in a living organism are mostly photochemical, then the proven laws of photochemistry are powerful evidence-based arguments. And the decisive argument for photobiomodulation therapy will be a very young quantum theory of the biological action of light, which is in a state of rapid development.
It turns out a paradoxical situation - photobiomodulation therapy, which for decades pharmacists considered to be a competitor, becomes the "magic wand" that will restore the reputation of both antibiotic therapy and all pharmacotherapy.
Conclusion: This direction - pharmacotherapy plus photobiomodulation therapy - will be dominant in the next 5-7 years both in scientific research and in applied medicine. And these studies and clinical trials will be completed with the development of new treatment protocols in which photobiomodulation therapy will occupy a worthy place as an equal, and in some cases, as a leading therapeutic factor. The signing of the peace protocol will end the long-term "war" of pharmacotherapy against photobiomodulation therapy.

APPLICATIONS OF PHOTOBIOMODULATION THERAPY ALONE OR IN COMBINATION WITH KINESIOTHERAPY FOR TREATMENT OF KNEE OSTEOARTHRITIS

Alessandra Baptista, G.P.R Gomes, S.C. Nunez, A.F. Frade-Barros, D.S.F. Magalhães

Bioengineering Program, Universidade Brasil, São Paulo, Brazil

Knee Osteoarthritis (KO) is an inflammatory disease characterized by progressive reduction of joint cartilage and formation of osteophytes, which cause pain, stiffness and decreased functional capacity. Usually, questionnaires are applied to evaluate the functionality provided by different KO treatments. The WOMAC questionnaire is the most appropriate to assess physical limitations because it assesses pain, joint stiffness and functionality. The aim of this study was to investigate the effects of kinesiotherapy (KIN) and photobiomodulation (PBM) alone or associated using the WOMAC questionnaire. Eighty-seven male and female patients aged between 45-80 years with KO were randomly divided into 4 groups: KIN Group; PBM Group; KIN + PBM Group; and PBM + KIN Group. All groups received treatments 3 times a week, totaling 10 sessions. KIN groups received supervised exercises as stretching and muscle strengthening. PBM groups received 9 irradiation points (l = 808 nm; P = 100 mW, 3 J per point). Evaluations were performed before treatment, 48 h after the fifth session (EV1) and 48 h after the tenth session (EV2). The results showed that in terms of pain and functionality, all groups showed statistically significant improvement of symptoms in all evaluations ($p < 0.05$). In the item joint stiffness, only K + PBMG showed no significant improvement in EV1 ($p > 0.05$), however in EV2 all groups showed significant improvements ($p < 0.05$). We conclude that PBM in the tested parameter, associated or not with KIN may be a good alternative in improving the quality of life in patients with KO.

EFFECTS OF LASER PHOTOBIOMODULATION ON SPASTIC MUSCLE: BIOMECHANICAL ANALYSIS

Gabriela Souza, Marcele Florêncio Neves, Ana Paula Pinto, Carolina Lobo Guimarães, Leticia Tiemi Maegima, Bruna Moreira de Oliveira Spinelli, Rodrigo Alvaro Brandão Lopes-Martins, Fernanda Pupio Silva Lima, Emilia Angela Lo Schiavo Arisawa, Mário Oliveira Lima

Sao Jose Dos Campos, Univap Sao Paulo, Brazil

Photobiomodulation (PBM) is an innovative resource that has been used in many neurological disorders. Among these disorders, stroke is one of the biggest causes of disability. Annually, 15 million people worldwide suffer a stroke. Of these, 5 million die and another 5 million are left permanently disabled, placing a burden on family and community. Their weakness or numbness of the arm and leg, most often on one side of the body, is caused by spasticity and affects gait, balance and motor coordination, compromising activities of daily living. However, few studies investigate PBM effects on the spastic muscle.
Objective: This study aimed to evaluate the effect of PBM (780nm) on spastic muscles of individuals after stroke.
Methods: This trial is a randomized, double-blind, with a sample of 12 post-stroke volunteers. Basal blood lactate, torque evaluation on the Isokinetic Dynamometer associated with spastic biceps brachii muscle surface electromyography (EMG) during Maximal V oluntary Isometric Contraction for 60 seconds, comparing the results before and after 10 PBM sessions (780nm on 16 points along spastic brachii biceps muscle).
Results: After PBM, a significant increase in the mean EMG RMS, from 4.57E+06 uV to 6. 10E+06 uV; and a reduction in blood lactate, from 5.4 ±1.3 mmol/l to 4.4±1.0 mmol/l. However, after 10 PBM sessions we did not observe changes in the muscle torque, 14.2±8.4 N.m to 14.8±9.6 N.m.
Conclusion: PBM applied in spastic muscle of post stroke individuals presents significant positive results regarding the recruitment of motor units and lower fatigue for maintaining isometric strength.

METHODOLOGICAL STUDY OF PHOTOBIOMODULATION ANTI-EDEMATOUS EFFECTS ON CARRAGEENAN-INDUCED INFLAMMATION ON ZEBRAFISH

[1]Silvia Cristina Nunez, [1]Ives Charles da Silva, [1]Jonathan Simplicio Nascimento, [2]Martha Simoes Riberio

[1]Universidade Brasil, [2] IPEN-CNEN - Sao Paulo, Brazil

The anti-inflammatory action of Photobiomodulation (PBM) is one of its most reproducible effects in vivo. New models to study PBM effects and to investigate light dosimetry may bring different perspectives on the field. Based on the importance of establishing new experimental models and the advantages of using zebrafish for screening new drugs with potential anti-inflammatory effects the present investigation evaluated the effect of PBM on carragenan-induced abdominal edema in zebrafish. Thirty Danio rerio (± 1 g) zebrafish were randomly divided into five aquariums with 0.25L of water to establish three treatments: T1 - Naive non-treated; T2 – Saline 0.9%-injected; T3 - carrageenan-injected (CG) 3.5% in the coelomic cavity. T4 –injected (CG) 3.5% and treated with a diode laser λ=808nm, 50mW and 0.5J T5 –same parameters with 1J and T6 -1.5J. Abdominal volumes were measured by a caliper and the area was calculated 4 hours post-indu ction. Four hours after edema induction the results revealed an increase in the abdominal area of fish injected with CG 3.5% compared to negative control. The animals injected with CG and treated with PBM exhibited a reduction in abdominal edema in a dose-dependent manner. The 0.5J energy did not present a significant reduction compare do control (p=0.18), the 1J and 1.5J groups presented a significant difference (p=0.027 and p=0.005 respectively). The 1.5J group was not different from negative control (T2) p=0.37. The present study identified that zebrafish may represent a good model to investigate PBM effects and the response was dose dependent.

ANALYSIS OF THE EFFECTS OF PHOTOBIOMODULATION ON THE IN VITRO ACTIVITY OF CHONDROCYTES IN AN EXPERIMENTAL MODEL OF COLLAGEN-INDUCED ARTHRITIS

Pamella Gabriela dos Santos Fereira, Solange Almeida dos Santos, Jheniphe Rocha Caires, Fenando de Jesus da Silva, Rodrigo Labat Marcos, Paulo de Tarso Camillo de Carvalho

São Paulo, São Paulo Universidade Nove de Julho - UNINOVE

Background and Purpose: This study aimed to analyze in vitro effects of photobiomodulation therapy on metalloproteínases 9 and 13 (MMPs), collagen II and Runx-2 and ADAMTS-4 and 5 in Chondrocytes culture obtained from an experimental model of rheumatoid Collagen-induced arthritis (CIA).
Materials and methods: Twenty-four male Wistar rats were submitted to a CIA protocol, by means of 2 immunizations of Freund's complete adjuvant associated with collagen II and after was applied 3rd dose in knee joint and then the chondrocytes culture were extracted from the articular cartilages. The resulting cells were divided into one group untreated control and the other with PBMT treatment. The culture received pre-conditioning with PBMT for 3 days, with a power of 50 mW, wavelength of 660 nm, beam area of 0.028 cm2, irradiance of 1.78 W/cm2, the energy used was 0.3 joul es and r adiant exposure of 10.7 J/cm2. Statistical analysis by ANOVA with Tukey's post-hoc test with $p < 0.05$.
Results: The use of PBMT resulted in the downregulation of the mRNA expression of metalloproteinases (MMP-9, MMP-13) in CIA cartilage tissue culture, when compared to The CIA Group non PBMT ($p < 0.01$). They also caused the upregulation of COL2-1, mRNA expression, as well as the protein expression compared to the control group.
Discussion and Conclusions: The PBMT prevented joint degeneration resulting from type II collagen degradation and modulated by downregulating Runx-2 and ADAMTS-4 and 5 and MMPs in the PBMT group.

EFFECTS OF LASER PHOTOBIOMODULATION ON EXPERIMENTAL SPINAL CORD INJURY IN RATS: BIOMECHANICAL ANALYSIS

C. A. Guimaraes, M.Sc.; A P C Pereira, M.Sc.; G A S Souza, M.Sc.; E H P Polisel, M.Sc.; E M P Pröglhöf, M.Sc.; J L R Fonseca, M.Sc.; M F Neves, PhD.; L B Sant'Anna, PhD.; R A B Lopes-Martins, PhD.; F P S Lima, PhD.; E A L Arisawa, PhD.; M O Lima, PhD.

São josé dos Campos, São Paulo Universidade do Vale do Paraíba, Instituto de Pesquisa e Desenvolvimento - Laboratório de Engenharia de Reabilitação Sensório Motora

Spinal cord injury (SCI) can cause complete or incomplete loss of sensory-motor functions below the level of the lesion. Considering the serious consequences and sequelae that can arise after these types of lesions, the existing treatments are ineffective to induce significant improvements of the picture. Laser Photobiomodulation (PBM) has been demonstrated to improve acute and chronicle conditions that involves the inflammatory process, including trauma, allergic and immunological reactions, tissue repair and others. However, few studies investigate its effects on the treatment of spinal cord injuries and respective sequelae.
Objective: The purpose od the present study was to analyze the effect of PBM (780nm) on the motor function of animals submitted to SCI by controlled spinal hemisection at the T9-T10 level.
Methods: Fourteen male Wistar rats were allocated to the experimental groups: Control, Injury and PBM. The sciatic functional index (SFI) and the kinemat ic analyses of these animals were evaluated at 7, 14 and 21 days.
Results: At 14 and 21 days after SCI, a significant increase in the mean velocity in all groups. However, after 14 days we could observe a highly significant improvement of SFI in the PBM group.
Conclusion: PBM applied in animals submitted to medullary hemisection presents significant positive results regarding the recovery of the motor function of the animals. Key words: Spinal cord injury, Laser Photobiomodulation SFI, LLLT, Kinematics.

APPLICATION OF PHOTOBIOMODULATION BEFORE OR AFTER HIGH- INTENSITY RESISTIVE EXERCISE HAS SIMILAR IMPACT ON MUSCULAR OXIDATIVE STRESS?

Simone Sunemi, HA de Oliveira, BSDM Mansano, ILA Teixeira, FA Silva, CS Oliveira, PJF Tucci, AJ Serra

Universidade Nove de Julho, São Paulo–SP, Brazil.
Universidade Federal de São Paulo, São Paulo –SP, Brazil.

Background: Recent data show that applying low-level laser therapy (LLLT) before high-intensity resistive exercise (RE) attenuates muscle oxidative stress. However, when is the best moment to apply light (pre- or post-RE) remain unclear.
*Purpose:*To investigate the effect of LLLT before or after a RE session on muscle oxidative stress markers.
Material and Methods: Female Wistar rats were assigned to one of the following groups: Sham, non-exercised submitted to placebo-LLLT; RE, exercised submitted to placebo-LLLT; L+RE, pre-exercise LLLT; RE+L, post-exercise LLLT. The RE consisted of four maximum load climbs. An 830-nm DMC Lase Photon III was applied on three points in gastrocnemius muscles (two limbs) with the radiant energy of 4J. Animals were euthanized after 60 min after the end of the exercise, and muscle tissue was removed for analysis of malondialdehyde (MDA), oxidized protein (OP), superoxide dismutase (SOD), catalase (CAT), and nitric oxide (NO).
Results: MDA and OP levels were significantly higher in the RE group. Moreover, CAT activity was downregulated by RE. All LLLT groups