

The analgesic effect of thermal therapy after total knee arthroplasty.

[Wong CH](#), [Lin LC](#), [Lee HH](#), [Liu CF](#).

Source

Graduate Institute of Clinical Medical Sciences, Tao-Yuan, Taiwan.

Abstract

OBJECTIVES:

Pain induced by surgery is a dynamic symptom, which may be quite variable even in the same surgical procedures. The purpose of this study was to investigate the analgesic effect of far infrared rays on the patients during the postoperative period of total knee arthroplasty (TKA). The selection and application of analgesic methods after the orthopedic surgery are therefore valuable for advanced studies.

DESIGN:

The quasi-experimental design with a total five consecutive days of far infrared ray (FIR) thermal therapy was employed in this study.

SUBJECTS:

The study involved 41 participants assigned by register code entry on computer to either the intervention or the control group.

INTERVENTION:

The FIR pads were applied on the acupoints of ST37 (Shang Chu Hsu), ST38 (Tiao Kou), ST39 (Hsia Chu Hsu), and ST40 (Feng Lung) of the patients involved in the experimental group from the third day to the fifth day after the TKA. Outcome measures: The analgesic effect was evaluated via the pain intensity of the numeric rating scale (NRS) level and serum concentration of interleukin-6 (IL-6) and endothelin-1 (ET-1).

RESULTS: The FIR showed that the significant effects are on relieving pain and lowering the levels of IL-6 and ET-1. The results cannot only be the reference for the postoperative pain relief of TKA, but it can also be the database of another clinical application.

CONCLUSIONS: This study demonstrated that the FIR can lower the NRS of pain and thus reduce the discomfort experienced by the patient. Findings indicated that effective application of FIR decreased the serum level of IL-6 and ET-1, which represent the subjective indicator of pain.

Repeated thermal therapy improves impaired vascular endothelial function in patients with coronary risk factors.

[Imamura M](#), [Biro S](#), [Kihara T](#), [Yoshifuku S](#), [Takasaki K](#), [Otsuji Y](#), [Minagoe S](#), [Toyama Y](#), [Tei C](#).

Source

First Department of Internal Medicine, Faculty of Medicine, Kagoshima University, Sakuragaoka, Kagoshima, Japan.

Abstract

OBJECTIVES:

We sought to determine whether sauna therapy, a thermal vasodilation therapy, improves endothelial function in patients with coronary risk factors such as hypercholesterolemia, hypertension, diabetes mellitus and smoking.

BACKGROUND:

Exposure to heat is widely used as a traditional therapy in many different cultures. We have recently found that repeated sauna therapy improves endothelial and cardiac function in patients with chronic heart failure.

METHODS:

Twenty-five men with at least one coronary risk factor (risk group: 38 +/- 7 years) and 10 healthy men without coronary risk factors (control group: 35 +/- 8 years) were enrolled. Patients in the risk group were treated with a 60 degrees C far infrared-ray dry sauna bath for 15 min and then kept in a bed covered with blankets for 30 min once a day for two weeks. To assess endothelial function, brachial artery diameter was measured at rest, during reactive hyperemia (flow-mediated endothelium-dependent dilation [%FMD]), again at rest and after sublingual nitroglycerin administration (endothelium-independent vasodilation [%NTG]) using high-resolution ultrasound.

RESULTS: The %FMD was significantly impaired in the risk group compared with the control group (4.0 +/- 1.7% vs. 8.2 +/- 2.7%, $p < 0.0001$), while %NTG was similar (18.7 +/- 4.2% vs. 20.4 +/- 5.1%). Two weeks of sauna therapy significantly improved %FMD in the risk group (4.0 +/- 1.7% to 5.8 +/- 1.3%, $p < 0.001$). In contrast, %NTG did not change after two weeks of sauna therapy (18.7 +/- 4.2% to 18.1 +/- 4.1%).

CONCLUSIONS: Repeated sauna treatment improves impaired vascular endothelial function in the setting of coronary risk factors, suggesting a therapeutic role for sauna treatment in patients with risk factors for atherosclerosis.

Biological effect of far-infrared therapy on increasing skin microcirculation in rats.

[Yu SY](#), [Chiu JH](#), [Yang SD](#), [Hsu YC](#), [Lui WY](#), [Wu CW](#).

Source

Institute of Molecular and Cellular Biology, Department of Life Science, National Tsing-Hua University, Hsinchu, and Division of General Surgery, Department of Surgery, Veterans General Hospital, Taipei, Taiwan.

Abstract

BACKGROUND/PURPOSE:

Insufficient microcirculation of skin leads to acute and chronic tissue ischemia in cases of trauma, reconstructive surgery, diabetes mellitus and peripheral arterial occlusive disease. The autonomic nervous system and nitric oxide (NO) play important roles in maintaining blood perfusion of the skin. Far-infrared (FIR) therapy provides low energy of light emitted from an artificial radiator and has been used to treat many vascular-related disorders. Nevertheless, the mechanisms through which FIR works remain unclear. The present study aims to test the hypothesis that the effect of FIR is through increasing skin microcirculation by a mechanism other than its thermal effect.

METHODS:

Sixty rats were used in the present study. A WS TY301 FIR emitter was placed 20 cm above the rats. Skin temperature and blood flow were continuously measured by a K-type thermocouple. Under laboratory control, the abdominal skin temperature steadily increased from 38-39 degrees C, and was kept at constant temperature. Skin microcirculation was measured with a continuous laser Doppler flowmeter.

RESULTS: There was no significant change of skin blood flow during FIR treatment. Skin blood flow increased significantly soon after the removal of the FIR emitter. The stimulating effect on skin blood flow was more significant in the rats treated with FIR for 45 min and could be sustained as long as 60 min. These findings suggested a non-thermic biological effect of FIR on skin microcirculation. The promotive effect of FIR on increasing skin blood flow was not influenced by pretreatment of APP (atropine, propranolol and phentolamine), but was suppressed by pretreatment with NG-nitro-L-arginine methyl ester (an endothelial nitric oxide synthase inhibitor).

CONCLUSION: In conclusion, FIR therapy exerts a NO-related biological effect to increase skin microcirculation in rats. This might bring into perspective the clinical application of FIR to treat ischemic disease by augmenting L-arginine/NO pathway.

Far-infrared therapy: a novel treatment to improve access blood flow and unassisted patency of arteriovenous fistula in hemodialysis patients.

[Lin CC](#), [Chang CF](#), [Lai MY](#), [Chen TW](#), [Lee PC](#), [Yang WC](#).

Source

Division of Nephrology, Institute of Clinical Medicine and School of Medicine, National Yang-Ming University, Taipei, Taiwan, Republic of China.

Abstract

Vascular access malfunction, usually presenting with an inadequate access flow (Qa), is the leading cause of morbidity and hospitalization in hemodialysis (HD) patients. Many methods of thermal therapy have been tried for improving Qa but with limited effects. This randomized trial was designed to evaluate the effect of far-infrared (FIR) therapy on access flow and patency of the native arteriovenous fistula (AVF). A total of 145 HD patients were enrolled with 73 in the control group and 72 in the FIR group. A WS TY101 FIR emitter was used for 40 min, and hemodynamic parameters were measured by the Transonic HD(02) monitor during HD. The Qa(1)/Qa(2) and Qa(3)/Qa(4) were defined as the Qa measured at the beginning/at 40 min later in the HD session before the initiation and at the end of the study, respectively. The incremental change of Qa in the single HD session with FIR therapy was significantly higher than that without FIR therapy (13.2 +/- 114.7 versus -33.4 +/- 132.3 ml/min; P = 0.021). In comparison with control subjects, patients who received FIR therapy for 1 yr had (1) a lower incidence (12.5 versus 30.1%; P < 0.01) and relative incidence (one episode per 67.7 versus one episode per 26.7 patient-months; P = 0.03) of AVF malfunction; (2) higher values of the following parameters, including Delta(Qa(4) - Qa(3)) (36.2 +/- 82.4 versus -12.7 +/- 153.6 ml/min; P = 0.027), Delta(Qa(3) - Qa(1)) (36.3 +/- 166.2 versus -51.7 +/- 283.1 ml/min; P = 0.035), Delta(Qa(4) - Qa(2)) (99.2 +/- 144.4 versus -47.5 +/- 244.5 ml/min; P < 0.001), and Delta(Qa(4) - Qa(2)) - Delta(Qa(3) - Qa(1)) (62.9 +/- 111.6 versus 4.1 +/- 184.5 ml/min; P = 0.032); and (3) a better unassisted patency of AVF (85.9 versus 67.6%; P < 0.01). In conclusion, FIR therapy, a noninvasive and convenient therapeutic modality, can improve Qa and survival of the AVF in HD patients through both its thermal and its nonthermal effects.

Effects of far-infrared ray on reproduction, growth, behaviour and some physiological parameters in mice.

[Udagawa Y](#), [Nagasawa H](#).

Source

Experimental Animal Research Laboratory, Meiji University, Kanagawa, Japan.

Abstract

The effects of chronic exposure to far-infrared ray (FIR) on reproduction, growth, behaviour, survival time and some related parameters were examined in SHN mice. The reproductive parameters differed slightly between the females on the normal racks and those on the FIR racks, which emitted FIR from the ceiling. The age and body weight on the day of vaginal opening was lower in the experimental mice born and maintained on the FIR rack than in the control on the normal rack. In both sexes, the levels of urinary components in the experimental group was significantly higher than the control at 6-7 months of age. Spontaneous motor activity of females during the light and dark phases were higher and lower, respectively, in the experimental group than the control. The survival rate was significantly higher in the experimental group than the control. These findings suggest that FIR has 'normalization effects' on the organisms.

Promotive Effects of Far-Infrared Ray on Full-Thickness Skin Wound Healing in Rats

[Hideyoshi Toyokawa*](#), [Yoichi Matsui*](#), [Junya Uhara*](#), [Hideto Tsuchiya*](#), [Shigeru Teshima*](#), [Hideki Nakanishi*](#), [A-Hon Kwon*](#), [Yoshihiko Azuma‡](#), [Tetsuo Nagaoka§](#), [Takafumi Ogawa§](#) and [Yasuo Kamiyama*†,1](#)

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2. *†Regeneration Research Center for Intractable Diseases, Kansai Medical University, Moriguchi City, Osaka, 570-8507, Japan;*
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Abstract

The biological effects of far-infrared ray (FIR) on whole organisms remain poorly understood. The aim of our study was to investigate not only the hyperthermic effect of the FIR irradiation, but also the biological effects of FIR on wound healing. To evaluate the effect of FIR on a skin wound site, the speed of full-thickness skin wound healing was compared among groups with and without FIR using a rat model. We measured the skin wound area, skin blood flow, and skin temperature before and during FIR irradiation, and we performed histological inspection. Wound healing was significantly more rapid with than without FIR. Skin blood flow and skin temperature did not change significantly before or during FIR irradiation. Histological findings revealed greater collagen regeneration and infiltration of fibroblasts that expressed transforming growth factor- β 1 (TGF- β 1) in wounds in the FIR group than in the group without FIR. Stimulation of the secretion of TGF- β 1 or the activation of fibroblasts may be considered as a possible mechanisms for the promotive effect of FIR on wound healing independent of skin blood flow and skin temperature.

Repeated thermal therapy up-regulates endothelial nitric oxide synthase and augments angiogenesis in a mouse model of hindlimb ischemia.

[Akasaki Y](#), [Miyata M](#), [Eto H](#), [Shirasawa T](#), [Hamada N](#), [Ikeda Y](#), [Biro S](#), [Otsuji Y](#), [Tei C](#).

Source

Department of Cardiovascular, Respiratory and Metabolic Medicine, Graduate School of Medicine, Kagoshima University, Sakuragaoka, Japan.

Abstract

BACKGROUND:

Nitric oxide (NO), constitutively produced by endothelial NO synthase (eNOS), plays roles in angiogenesis. Having reported that thermal therapy up-regulated the expression of arterial eNOS in hamsters, we investigated whether this therapy increased angiogenesis in mice with hindlimb ischemia.

METHODS AND RESULTS:

Unilateral hindlimb ischemia was induced in apolipoprotein E-deficient mice, which were divided into control and thermal therapy groups. The latter mice were placed in a far-infrared dry sauna at 41 degrees C for 15 min and then at 34 degrees C for 20 min once daily for 5 weeks. Laser Doppler perfusion imaging demonstrated that the ischemic limb/normal side blood perfusion ratio in the thermal therapy group was significantly increased beyond that in controls (0.79 ± 0.04 vs 0.54 ± 0.08 , $p<0.001$). Significantly greater capillary density was seen in thermal therapy group (757 ± 123 /mm² vs 416 ± 20 /mm², $p<0.01$). Western blotting showed thermal therapy markedly increased hindlimb eNOS expression. To study possible involvement of eNOS in thermally induced angiogenesis, thermal therapy was given to mice with hindlimb ischemia with or without N(G)-nitro-L-arginine methyl ester (L-NAME) administration for 5 weeks. L-NAME treatment eliminated angiogenesis induced using thermal therapy. Thermal therapy did not increase angiogenesis in eNOS-deficient mice.

CONCLUSION:

Angiogenesis was induced via eNOS using thermal therapy in mice with hindlimb ischemia.

Repeated sauna therapy increases arterial endothelial nitric oxide synthase expression and nitric oxide production in cardiomyopathic hamsters.

[Ikeda Y](#), [Biro S](#), [Kamogawa Y](#), [Yoshifuku S](#), [Eto H](#), [Orihara K](#), [Yu B](#), [Kihara T](#), [Miyata M](#), [Hamasaki S](#), [Otsuji Y](#), [Minagoe S](#), [Tei C](#).

Source

Department of Cardiovascular, Respiratory and Metabolic Medicine, Graduate School of Medicine, Kagoshima University, Kogoshima, Japan.

Abstract

BACKGROUND:

Vascular endothelial dysfunction is involved in the pathophysiology of chronic heart failure (CHF). It has been reported that sauna therapy, which allows thermal vasodilation, improves vascular endothelial dysfunction in patients with CHF. The present study investigates the mechanisms through which sauna therapy improves endothelial dysfunction induced by CHF.

METHODS AND RESULTS:

Normal control and male TO-2 cardiomyopathic hamsters were used. Thirty-week-old TO-2 hamsters were treated daily with an experimental far infrared-ray dry sauna system for 15 min at 39 degrees C followed by 20 min at 30 degrees C. This procedure raised the rectal temperatures by about 1 degrees C. Arterial endothelial nitric oxide (NO) synthase (eNOS) mRNA and protein expressions were examined, and serum concentrations of nitrate were measured. The expression of eNOS mRNA in the aortas of normal controls did not change, whereas those of the TO-2 hamsters decreased with age. Four weeks of sauna therapy significantly increased eNOS mRNA expression in the aortas of TO-2 hamsters compared with those that did not undergo sauna therapy. Sauna therapy also upregulated aortic eNOS protein expression. Serum nitrate concentrations of the TO-2 hamsters were increased by 4 weeks of sauna therapy compared with those that did not undergo sauna.

CONCLUSION:

Repeated sauna therapy increases eNOS expression and NO production in cardiomyopathic hamsters with heart failure.

Effects of repeated sauna treatment on ventricular arrhythmias in patients with chronic heart failure.

[Kihara T](#), [Biro S](#), [Ikeda Y](#), [Fukudome T](#), [Shinsato T](#), [Masuda A](#), [Miyata M](#), [Hamasaki S](#), [Otsuji Y](#), [Minagoe S](#), [Akiba S](#), [Tei C](#).

Source

Department of Cardiovascular, Graduate School of Medicine, Kagoshima University, Sakuragaoka, Kagoshima, Japan.

Abstract

BACKGROUND:

The aim of the present study was to determine whether repeated 60 degrees C sauna treatment improves cardiac arrhythmias in chronic heart failure (CHF) patients, because ventricular arrhythmias are an important therapeutic target in CHF.

METHODS AND RESULTS:

Thirty patients (59 \pm 3 years) with New York Heart Association functional class II or III CHF and at least 200 premature ventricular contractions (PVCs)/24 h assessed by 24-h Holter recordings were studied. They were randomized into sauna-treated (n=20) or non-treated (n=10) groups. The sauna-treated group underwent a 2-week program of a daily 60 degrees C far infrared-ray dry sauna for 15 min, followed by 30 min bed rest with blankets, for 5 days per week. Patients in the non-treated group had bed rest in a temperature-controlled room (24 degrees C) for 45 min. The total numbers of PVCs/24 h in the sauna-treated group decreased compared with the non-treated group [848 \pm 415 vs 3,097 \pm 1,033/24 h, p<0.01]. Heart rate variability (SDNN, standard deviation of normal-to-normal beat interval) increased [142 \pm 10 (n=16) vs 112 \pm 11 ms (n=8), p<0.05] and plasma brain natriuretic peptide concentrations decreased [229 \pm 54 vs 419 \pm 110 pg/ml, p<0.05] in the sauna-treated group compared with the non-treated group.

CONCLUSION:

Repeated sauna treatment improves ventricular arrhythmias in patients with CHF.

Randomized clinical trial of the influence of local water-filtered infrared A irradiation on wound healing after abdominal surgery.

[Hartel M](#), [Hoffmann G](#), [Wente MN](#), [Martignoni ME](#), [Büchler MW](#), [Friess H](#).

Source

Department of General Surgery, University of Heidelberg, Heidelberg, Germany.

Abstract

BACKGROUND:

Postoperative local water-filtered infrared A (wIRA) irradiation improves tissue oxygen partial pressure, tissue perfusion and tissue temperature, which are important in wound healing.

METHODS:

The effect of wIRA irradiation on abdominal wound healing following elective gastrointestinal surgery was evaluated. Some 111 patients undergoing moderate to major abdominal surgery were randomized into one of two groups: wIRA and visible light irradiation (wIRA group) or visible light irradiation alone (control group). Uncovered wounds were irradiated twice a day for 20 min from days 2-10 after operation.

RESULTS:

Irradiation with wIRA improved postoperative wound healing in comparison to visible light irradiation alone. Main variables of interest were: wound healing assessed on a visual analogue scale (VAS) by the surgeon (median 88.6 versus 78.5 respectively; $P < 0.001$) or patient (median 85.8 versus 81.0; $P = 0.040$), postoperative pain (median decrease in VAS score during irradiation 13.4 versus 0; $P < 0.001$), subcutaneous oxygen tension after irradiation (median 41.6 versus 30.2 mmHg; $P < 0.001$) and subcutaneous temperature after irradiation (median 38.9 versus 36.4 degrees C; $P < 0.001$). The overall result, in terms of wound healing, pain and cosmesis, measured on a VAS by the surgeon (median 79.0 versus 46.8; $P < 0.001$) or patient (79.0 versus 50.2; $P < 0.001$) was better after wIRA irradiation.

CONCLUSION:

Postoperative irradiation with wIRA can improve normal postoperative wound healing and may reduce costs in gastrointestinal surgery.

Repeated sauna therapy reduces urinary 8-epi-prostaglandin F(2alpha).

[Masuda A](#), [Miyata M](#), [Kihara T](#), [Minagoe S](#), [Tei C](#).

Source

Department of Cardiology, Respiratory and Metabolic Medicine, Kagoshima University, Kagoshima, Japan.

Abstract

We have reported that repeated sauna therapy improves impaired vascular endothelial function in a patient with coronary risk factors. We hypothesized that sauna therapy decreases urinary 8-epi-prostaglandin F(2alpha) (PGF(2alpha)) levels as a marker of oxidative stress and conducted a randomized, controlled study. Twenty-eight patients with at least one coronary risk factor were divided into a sauna group (n = 14) and non-sauna group (n = 14). Sauna therapy was performed with a 60 degrees C far infrared-ray dry sauna for 15 minutes and then bed rest with a blanket for 30 minutes once a day for two weeks. Systolic blood pressure and increased urinary 8-epi-PGF(2alpha) levels in the sauna group were significantly lower than those in the non-sauna group at two weeks after admission (110 +/- 15 mmHg vs 122 +/- 13 mmHg, $P < 0.05$, 230 +/- 67 pg/mg x creatinine vs 380 +/- 101 pg/mg x creatinine, $P < 0.0001$, respectively). These results suggest that repeated sauna therapy may protect against oxidative stress, which leads to the prevention of atherosclerosis.

Local thermal therapy effects on menopausal symptoms and bone mineral density.

[Chien LW](#), [Liu SJ](#), [Chang Y](#), [Liu CF](#).

Source

Department of Obstetrics and Gynecology, Taipei Medical University Hospital, Taipei, Taiwan.

Abstract

OBJECTIVES:

The aim of this study was to evaluate the effects of local thermal therapy with far-infrared rays (FIR) on menopausal symptoms and bone mineral density (BMD) in postmenopausal women.

SUBJECTS AND METHODS:

A prospective randomized, controlled trial was conducted in female volunteers from communities in Northern Taiwan. The intervention group (n=22) received local thermal therapy with the help of FIR from an FIR emitter, for approximately 20 minutes per day, twice a week, for 20 sessions. They received the therapy on their backs while lying in a supine position. The control group (n=21) received no treatment. The primary outcome was the change in the Perceived Perimenopausal Disturbances Scale, designed for the measurement of menopause-related symptoms (MRS) before and after completion of treatment in a 10-week period. Secondary outcome parameters included serum levels of estradiol (E2) with osteocalcin (OC), and calcaneal BMD by quantitative ultrasound.

RESULTS: After 10 weeks of intervention, MRS determined by the scale decreased in mean total scores and mean scores for vasomotor, musculoskeletal, urologic, reproductive, and psychologic domains ($p < 0.05$), except for reproductive (sexuality-related) symptoms. In the control group, mean total scores and scores of each domain had no significant difference between baseline and follow-up examination after 10 weeks. There was no significant difference between the quantitative ultrasound parameters in the calcaneus, serum E2, and OC levels either at the baseline or in the changes from the baseline between the intervention and control groups of women ($p > 0.05$).

CONCLUSIONS: Local thermal therapy with FIR results in a significant reduction of MRS in postmenopausal women. Serum E2, OC levels, and calcaneal BMD showed no significant changes between the two groups. These results suggest that FIR local thermal therapy may be a potential alternative for the management of postmenopausal symptoms.

Effect of ultraviolet and far infrared radiation on microbial decontamination and quality of cumin seeds.

[Erdoğan SB](#), [Ekiz Hİ](#).

Source

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belgin_unal@yahoo.com

Abstract

Cumin seeds might be exposed to a high level of natural bacterial contamination, and this could potentially create a public health risk besides leading to problems in exportation. Ultraviolet (UVC) and far infrared (FIR) radiation has low penetration power, and due to that, there might be no detrimental defects to the products during a possible decontamination process. Therefore, the objective of this study was to determine the effect of UVC and FIR treatment on microbial decontamination and quality of cumin seeds. For this purpose, FIR treatment at different exposure times and temperatures were applied followed by constant UVC treatment with an intensity of 10.5 mW/cm² for 2 h. Total mesophilic aerobic bacteria of the cumin seeds were decreased to the target level of 10⁴ CFU/g after 1.57, 2.8, and 4.8 min FIR treatment at 300, 250, and 200 °C, respectively, following a 2 h UVC treatment. Under the given conditions, a complete elimination for total yeast and molds were obtained while there were no significant changes in volatile oil content and color of the cumin seeds. Consequently, combined UVC and FIR treatment was determined to be a promising method for decontamination of the cumin seeds. PRACTICAL APPLICATION: This research attempts to apply UVC and far infrared (FIR) radiation for pasteurization of cumin seeds. The data suggested that combined UVC and FIR radiation treatments can become a promising new method for pasteurization of cumin seeds without causing any detrimental defect to the quality parameters. The results of this industry partnered (Kadioglu Baharat, Mersin, Turkey--<http://www.kadioglubaharat.com>) study were already applied in industrial scale production lines.

Amelioration of experimental autoimmune encephalomyelitis in C57BL/6 mice by photobiomodulation induced by 670 nm light.

[Muili KA](#), [Gopalakrishnan S](#), [Meyer SL](#), [Eells JT](#), [Lyons JA](#).

Source

Department of Health Sciences, College of Health Sciences, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin, United States of America.

Abstract

BACKGROUND:

The approved immunomodulatory agents for the treatment of multiple sclerosis (MS) are only partially effective. It is thought that the combination of immunomodulatory and neuroprotective strategies is necessary to prevent or reverse disease progression. Irradiation with far red/near infrared light, termed photobiomodulation, is a therapeutic approach for inflammatory and neurodegenerative diseases. Data suggests that near-infrared light functions through neuroprotective and anti-inflammatory mechanisms. We sought to investigate the clinical effect of photobiomodulation in the Experimental Autoimmune Encephalomyelitis (EAE) model of multiple sclerosis.

METHODOLOGY/PRINCIPAL FINDINGS:

The clinical effect of photobiomodulation induced by 670 nm light was investigated in the C57BL/6 mouse model of EAE. Disease was induced with myelin oligodendrocyte glycoprotein (MOG) according to standard laboratory protocol. Mice received 670 nm light or no light treatment (sham) administered as suppression and treatment protocols. 670 nm light reduced disease severity with both protocols compared to sham treated mice. Disease amelioration was associated with down-regulation of proinflammatory cytokines (interferon- γ , tumor necrosis factor- α) and up-regulation of anti-inflammatory cytokines (IL-4, IL-10) in vitro and in vivo.

CONCLUSION/SIGNIFICANCE:

These studies document the therapeutic potential of photobiomodulation with 670 nm light in the EAE model, in part through modulation of the immune response.

[Analysis of facial far-infrared thermogram of patients with acute facial neuritis].

[Zhou ZL](#), [Jiang YB](#), [Li GB](#), [Gao YH](#).

Source

Department of Acupuncture and Moxibustion, Chinese PLA General Hospital, Beijing 100853, China. zhouzhangling@sina.com

Abstract

OBJECTIVE:

In order to provide an objective observational index for facial neuritis, the authors monitored the changes of facial far-infrared thermogram in patients with acute facial neuritis.

METHODS:

A total of 23 patients with acute facial neuritis were enrolled from Department of Acupuncture and Moxibustion, Chinese PLA General Hospital. Another 21 healthy participants were selected as the control group. Focal plane thermal imaging system (thermal sensitivity 0.05 degrees centigrade) was applied to collect facial far-infrared thermogram. Temperature differences in the thermogram of both sides of the cheeks, inner canthus, supraorbitals and forehead of the same patient were compared separately and statistically and analyzed by software provided by the imaging system.

RESULTS:

Results of far-infrared thermography of the patients displayed obvious temperature differences ranging from 0.01 to 0.26 degrees centigrade between two sides of the cheeks, inner canthus, supraorbitals and forehead areas. In the control group, far-infrared thermogram showed that there were no obvious temperature differences between two sides of the cheeks, inner canthus, supraorbitals and forehead. There were significant differences in temperature difference in the four monitoring areas between the two groups ($P < 0.01$). Among the 23 patients, there were 14 patients with congestive change, 7 with ischemic change and 2 with both congestive and ischemic changes.

CONCLUSION:

The facial far-infrared thermogram of patients with acute facial neuritis is characterized mainly by congestive changes. Far-infrared thermography can objectively reflect the changes of blood-supply status in patients with facial neuritis.

Far infrared ray irradiation attenuates apoptosis and cell death of cultured keratinocytes stressed by dehydration.

[Chen YC](#), [Lai LC](#), [Tu YP](#), [Wu SD](#), [Chen CF](#), [Li B](#).

Source

Department of Dermatology, Yueyang Hospital of Integrated Traditional Chinese and Western Medicine, Shanghai University of Traditional Chinese Medicine, Shanghai, China.

Abstract

Far infrared (FIR) irradiation has been widely applied in health promotion. The aims of this study were to investigate the protective effect of FIR irradiation on stressed keratinocytes and the signaling pathways involved. HaCaT was subjected to sorbitol dehydration with or without 40min pretreatment with FIR radiation 4h earlier. Western blots of cell lysates were analyzed for caspase-3, HO-1, BCL2, Bax, ERK, and Akt. The incidence of apoptosis was also assessed by TUNEL staining. Evaluation of cell viability was determined using MTT. mRNAs were extracted and compared using Illumina Human Ref-8 v2 BeadChips. Hyperosmotic injury of HaCaT cells caused by sorbitol resulted in increased cleaved caspase-3 expression and this effect was decreased by FIR pretreatment; these findings were confirmed by TUNEL staining and MTT tests. Pre-treatment with FIR irradiation before sorbitol-induced dehydration significantly upregulated phosphorylated Akt (p-Akt) levels and A6730, an Akt kinase inhibitor (5 μ M), attenuated the protective effect of FIR irradiation. A microarray study showed FIR irradiation had far less effect at the transcriptional level. FIR pretreatment attenuates apoptosis and cell death in dehydration-stressed cultured keratinocytes through the PI-3K/Akt pathway, this protective effect of FIR irradiation is not at the transcriptional level.

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A multicenter, randomized, double-blind, placebo-controlled trial evaluating the efficacy and safety of a far infrared-emitting sericite belt in patients with primary dysmenorrhea.

[Lee CH](#), [Roh JW](#), [Lim CY](#), [Hong JH](#), [Lee JK](#), [Min EG](#).

Source: Department of Obstetrics and Gynecology, Dongguk University Ilsan Hospital, College of Medicine, Dongguk University, Siksa-dong, Goyang, Gyeonggi-do, Republic of Korea.

OBJECTIVE: To determine the efficacy and safety of a sericite which emits far infrared rays in the management of primary dysmenorrhea.

DESIGN: A multicenter randomized double-blind placebo-controlled trial.

SETTING: One hundred four patients with primary dysmenorrhea were randomized to wear a sericite or placebo belt during sleep for 3 menstrual cycles, and followed for 2 menstrual cycles. Hot packs were used to heat the ceramics and ensure slight pain relief in both groups.

MAIN OUTCOME MEASURES: The main outcome measures were the severity of dysmenorrhea assessed by a 10-point visual analog scale (VAS) and the number of patients who took analgesics at each menstrual cycle. Safety was evaluated by physical examination and self-reporting of adverse events.

RESULTS: The baseline VAS scores were 7.27 ± 0.19 in the experimental group and 7.38 ± 0.19 in the control group. The severity of dysmenorrhea gradually decreased during the treatment period in both groups, with major improvements observed in the third treatment cycle (4.96 ± 0.30 in the experimental group and 5.69 ± 0.30 in the control group, $p=0.087$). During the follow-up period, the decreased VAS score was maintained in the experimental group, whereas the VAS score gradually returned to baseline in the control group, which resulted in significant difference between the groups (5.08 ± 0.31 vs. 6.47 ± 0.31 at cycle 5, difference -1.39 [95% CI, -2.25 to -0.53], $p=0.0017$). The number of patients who took analgesics decreased in both groups, but the differences were not statistically significant. No serious adverse events related to wearing the sericite belt occurred.

CONCLUSIONS: Our data suggest that a far infrared-emitting sericite belt with a hot pack might be used as an effective and safe non-pharmacologic treatment option for women with primary dysmenorrhea, with a prolonged effect after treatment.

[Effects of heat therapy using a far infrared rays heating element for dysmenorrhea in high school girls].

[Hong YR.](#)

Source

Department of Nursing, Chodang University, Muan, Korea. yrhong@chodang.ac.kr

Abstract

PURPOSE:

The purpose of this study was designed to identify the effects of heat therapy on dysmenorrhea, heat being provided using a far infrared rays heating element.

METHODS:

The research design for the study was a non-equivalent control group quasi-experimental design. Participants were 22 students for the experimental group, and 26 students for the control group. Data were analyzed using SAS WIN 9.1 program.

RESULTS:

The experimental group had significantly lower mean scores for menstrual pain, dysmenorrhea, and blood pressure than those in the control group. However, no significant differences were found between two groups for pulse, respiration, and temperature.

CONCLUSION:

These findings show that thermotherapy was effective for reduction of menstrual pain, dysmenorrhea, and B/P. Therefore, this therapy could be used as a nursing intervention for students with dysmenorrhea.

Efficacy of Waon therapy for fibromyalgia.

[Matsushita K](#), [Masuda A](#), [Tei C](#).

Source

The First Department of Internal Medicine, Kagoshima University Hospital.

Abstract

OBJECTIVE:

Fibromyalgia syndrome (FMS) is a chronic syndrome characterized by widespread pain with tenderness in specific areas. We examined the applicability of Waon therapy (soothing warmth therapy) as a new method of pain treatment in patients with FMS.

METHODS:

Thirteen female FMS patients (mean age, 45.2±15.5 years old; range, 25-75) who fulfilled the criteria of the American College of Rheumatology participated in this study. Patients received Waon therapy once per day for 2 or 5 days/week. The patients were placed in the supine or sitting position in a far infrared-ray dry sauna maintained at an even temperature of 60 degrees C for 15 minutes, and then transferred to a room maintained at 26-27 degrees C where they were covered with a blanket from the neck down to keep them warm for 30 minutes. Reductions in subjective pain and symptoms were determined using the pain visual analog scale (VAS) and fibromyalgia impact questionnaire (FIQ).

RESULTS:

All patients experienced a significant reduction in pain by about half after the first session of Waon therapy (11-70%), and the effect of Waon therapy became stable (20-78%) after 10 treatments. Pain VAS and FIQ symptom scores were significantly ($p<0.01$) decreased after Waon therapy and remained low throughout the observation period.

CONCLUSION:

Waon therapy is effective for the treatment of fibromyalgia syndrome.

A Pilot Study of Ceramic Powder Far-Infrared Ray Irradiation (cFIR) on Physiology: Observation of Cell Cultures and Amphibian Skeletal Muscle.

[Leung TK](#), [Lee CM](#), [Tsai SY](#), [Chen YC](#), [Chao JS](#).

Source

Department of Diagnostic Radiology, Taipei Medical University Hospital, Taipei 11042, Taiwan, Republic of China.

Abstract

The purpose of this research was to assess the potential for far-infrared ray irradiation from ceramic powder to improve exercise performance at room temperature. We designed experiments with murine myoblast cells (C2C12) to study the effect of cFIR irradiation on cell viability and lactate dehydrogenase release under H₂O₂-mediated oxidative stress and evaluated intracellular levels of nitric oxide and calmodulin. We also used electro-stimulation of amphibian skeletal muscle. Our results show that cFIR strengthened C2C12 under oxidative stress and delayed onset of fatigue induced by muscle contractions. We discuss possible mechanisms including anti-oxidation and prevention of acid build-up in muscle tissue based, and expect to see more applications of cFIR in the future.

Reduction in body measurements after use of a garment made with synthetic fibers embedded with ceramic nanoparticles.

[Conrado LA](#), [Munin E](#).

Source

Universidade Camilo Castelo Branco - Unicastelo, Núcleo do Parque Tecnológico de São José dos Campos, Eugênio de Melo, São José dos Campos, SP, Brazil.

Abstract

BACKGROUND:

Therapeutic effects have been attributed to far-infrared (FIR) radiation emitted from different types of sources. One class of such infrared emitters consists of ceramics in a powdered form, which allows for its incorporation into creams and fabrics. Such ceramic materials emit in the FIR when subjected to body temperature. Published literature reports significant improvement in both pathological conditions, such as pain and blood dyscrasias, and cellulite upon use of accessories containing ceramic emitters.

OBJECTIVES:

In this study, we investigated whether the use of a garment made with synthetic fibers embedded with powdered ceramic led to a reduction in body measurements.

METHODS:

The study population comprised 42 women divided into two groups: active and placebo. The volunteers used clothing either impregnated or not impregnated with ceramic powder for at least 8 h/day for 30 days.

RESULTS:

The experimental data showed a reduction in body measurements, which may be a consequence of an increment in microcirculation and peripheral blood flow, and these changes might promote improved general health.

CONCLUSIONS:

Objective indicators were identified which showed that the reported ceramic accessories actually were capable of biological modulation.

Effects of far-infrared radiation on lactation.

[Ogita S](#), [Imanaka M](#), [Matsuo S](#), [Takebayashi T](#), [Nakai Y](#), [Fukumasu H](#), [Matsumoto M](#), [Iwanaga K](#).

Source

Osaka City Perinatal Center, Japan.

Abstract

Massage and warm compresses to the breast have been commonly used for stimulating and/or increasing blood flow to the breasts, and for enhancing lactation consequently. However, more effective and easier remedies seem to be necessary. The vasodilating and warming effects of ceramics far-infrared radiation were studied. Based on the results obtained, the effect of a ceramic disc on lactation, attached to the breast skin, was evaluated in 27 puerperal women who had had poor lactation previously and in 36 with currently poor lactation monthly until weaning. Approximately 3/4 of these puerperal women enhanced lactation significantly one month after attachment and 1/2 of the women were able to breast-feed until weaning. Thus, we found that ceramics far-infrared radiation may be an effective remedy for enhancing lactation.

Biological activities caused by far-infrared radiation.

[Inoué S](#), [Kabaya M](#).

Abstract

Contrary to previous presumption, accumulated evidence indicates that far-infrared rays are biologically active. A small ceramic disk that emits far-infrared rays (4-16 microns) has commonly been applied to a local spot or a whole part of the body for exposure. Pioneering attempts to experimentally analyze an effect of acute and chronic radiation of far-infrared rays on living organisms have detected a growth-promoting effect in growing rats, a sleep-modulatory effect in freely behaving rats and an insomniac patient, and a blood circulation-enhancing effect in human skin. Questionnaires to 542 users of far-infrared radiator disks embedded in bedclothes revealed that the majority of the users subjectively evaluated an improvement of their health. These effects on living organisms appear to be non-specifically triggered by an exposure to far-infrared rays, which eventually induce an increase in temperature of the body tissues or, more basically, an elevated motility of body fluids due to decrease in size of water clusters.

Effect of ceramic-impregnated "thermoflow" gloves on patients with Raynaud's syndrome: randomized, placebo-controlled study.

[Ko GD](#), [Berbrayer D](#).

Source

Alternative Medicine Research, Department of Rehabilitation Medicine, Sunnybrook and Women's College Health Sciences Centre, University of Toronto, Ontario, Canada. gordon.ko@swchsc.on.ca

Abstract

OBJECTIVE:

To determine the efficacy of ceramic impregnated gloves in the treatment of Raynaud's syndrome.

DESIGN: Double-blind, placebo-controlled study.

SETTING: Teaching hospital outpatient clinic.

PARTICIPANTS: Ninety-three patients meeting the "Pal" criteria for Raynaud's syndrome.

INTERVENTIONS: Treatment period of three months with use of ceramic-impregnated gloves.

MAIN OUTCOME MEASURES: Primary end points: Pain visual analogue scale ratings and diary; Disabilities of the Arm, Shoulder, Hand questionnaire; Jamar grip strength; Purdue board test of hand dexterity. Secondary end points: Infrared skin temperature measurements; seven-point Likert scale rating of treatment.

RESULTS: In 60 participants with complete data, improvements were noted in the visual analogue scale rating ($p=0.001$), DASH score ($p=0.001$), Jamar grip strength ($p=0.002$), infrared skin fingertip temperature ($p=0.003$), Purdue hand dexterity test ($p=0.0001$) and the Likert scale ($p=0.001$) with ceramic gloves over the placebo cotton gloves.

CONCLUSION: The ceramic-impregnated "thermoflow" gloves have a clinically important effect in Raynaud's syndrome.