

**Magnetic And Laser Therapy Of Acute Ischemic Stroke**

[Article in Russian]

Vopr Kurortol Fizioter Lech Fiz Kult. 2003 Mar-Apr;(2):19-20.  
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The paper presents the technique of frequency-modulated magnetolaser therapy (FMMLT) used in combined treatment of 121 patients with ischemic stroke in acute period. The results were compared with those in the control group of 30 patients who received conventional drug treatment. The results of the comparison allowed the author to recommend FMMLT in ischemic stroke especially in the period of "therapeutic window".

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**Treatment Of Experimentally Induced Transient Cerebral Ischemia With Low Energy Laser Inhibits Nitric Oxide Synthase Activity And Up-Regulates The Expression Of Transforming Growth Factor-Beta 1**

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BACKGROUND AND OBJECTIVES: Nitric oxide (NO) has been shown to be neurotoxic while transforming growth factor-beta 1 (TGF-beta1) is neuroprotective in the stroke model. The present study investigates the effects of low energy laser on nitric oxide synthase (NOS) and TGF-beta1 activities after cerebral ischemia and reperfusion injury.

STUDY DESIGN/MATERIALS AND METHODS: Cerebral ischemia was induced for 1 hour in male adult Sprague-Dawley (S.D.) rats with unilateral occlusion of middle cerebral artery (MCAO). Low energy laser irradiation was then applied to the cerebrum at different durations (1, 5, or 10 minutes). The activity of NOS and the expression of TGF-beta1 were evaluated in groups with different durations of laser irradiation.

RESULTS: After ischemia, the activity of NOS was gradually increased from day 3, became significantly higher from day 4 to 6 ( $P < 0.001$ ), but returned to the normal level after day 7. The activity and expression of the three isoforms of NOS were significantly suppressed ( $P < 0.001$ ) to different extents after laser irradiation. In addition, laser irradiation was shown to trigger the expression of TGF-beta1 ( $P < 0.001$ ).

CONCLUSIONS: Low energy laser could suppress the activity of NOS and up-regulate the expression of TGF-beta1 after stroke in rats.

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**Effect Of Intravascular Laser Irradiation Of Blood And Traditional Chinese Medical Therapy On Immune Function In Senile Cerebral Infarction Patients Of Kidney Deficiency Type**

[Article in Chinese]

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OBJECTIVE: To observe the effect of intravascular laser irradiation of blood (ILIB) therapy on cellular immunity, change of T-lymphocyte subsets and humoral immunity in senile cerebral infarction patients of Kidney deficiency type.

METHODS: Seventy-five patients were divided randomly into the ILIB group and the control group treated by conventional medicine (CM). Serum CD3, CD4, CD8, IgG, IgA, IgM, C3 and C4

levels of patients were determined before and after treatment for self-control and comparing between various groups and that of normal control.

RESULTS: Before treatment, in patients of both groups, the levels of CD3, CD4, CD4/CD8, C3 were all lower than normal levels significantly, C4 and IgM higher than normal ( $P < 0.05$ ,  $P < 0.01$ ), the level of IgG lowered in patients inclined to Kidney-Yang deficiency and raised in those inclined to Kidney-Yin deficiency ( $P < 0.01$ ). After treatment, in the ILIB group, CD3, CD4 and CD4/CD8 raised significantly ( $P < 0.05$ ,  $P < 0.01$ ), IgG and C3 varied towards normal control ( $P < 0.01$ ,  $P < 0.05$ ), and C4 lowered but without significance. In the control group, the indexes changed also toward normal but without significance except the change of IgG ( $P < 0.05$ ). As for IgA and IgM, marked changes were not found in both groups in comparison between before and after treatment.

CONCLUSION: ILIB therapy could bi-directionally regulate cellular and humoral immunity in senile cerebral infarction patients of Kidney deficiency type, which was similar to the function in supplementing Qi and invigorating Kidney of Chinese herbal medicine.

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### **Intravascular Laser Therapy On The Cerebral Circulation Ischemic Disturbances**

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The dynamics of clinical and pathophysiological alterations on the various forms of cerebral circulation ischemic disturbances (CCID) was investigated in the course of helium-neon laser therapy (HNL). There were treated 600 patients. Clinical, vegetative, and neurophysiological pattern indices were examined. Results of the complex investigation reliably testified that vegetative indices play the important role in CCID pathogenesis, accompanied by pathologic neuro-dynamic disbalance formation. Patients with phase somatovegetative hyperactivity prevailed. Clinical effect of HNL correlated with system vegetative dynamic, its effectiveness was higher in the patients with initial sympathicotonia. HNL was not effective on cholinergic influences. After HNL positive neuro-physiological changes were registered in patients with initial adrenergic activity, there were no changes at cholinergic intensity or slight modulate effect was observed.

HNL improved blood circulation, blood filling was increased in the affected vascular basin, the increased cerebral arteries tone decreased, pulse blood filling increased, venous circulation was improved. Therefore, HNL has neurodynamic effect, relaxes sympathicotonic influences and has vagotrope regulatory effect. Photoneurodynamic HNL influence renders trophotroimages action, preventing or reducing cerebral tissue ischemization at all stages of cerebro-vascular diseases with sympatic pattern and is not expedient on neurodynamic disbalance in the form of parasympathicotonia. HNL allows to receive stable therapeutic effect in patients with initial cerebral blood supply insufficiency, transient disturbances of cerebral blood circulation, slight insult, ischemic insult in the acute phase, discirculatory encephalopathy at the first stage.

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### **Laser Acupuncture to Treat Paralysis in Stroke Patients, CT Scan Lesion Site Study**

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#### **Purpose:**

1) To study the effectiveness of low-level laser stimulation of acupuncture points to treat paralysis in stroke patients; 2) To examine the relationship between neuroanatomical lesion sites on CT scan and potential for improvement following laser acupuncture treatments. We have conducted

previous research with needle stimulation of acupuncture points in the treatment of paralysis in stroke patients (1-3).

**Subjects:**

Seven stroke patients participated (ages 48-71 years when entering the study; 5 men, 2 women). Five cases had single left hemisphere stroke; two cases, single right hemisphere stroke. Five patients were treated for residual arm/leg paralysis; they had greatly reduced arm and leg power (and severely reduced or no voluntary isolated finger movement). Two cases were treated only for hand paresis; they had good arm and leg power, but they had mildly reduced isolated finger movement. CT scans were obtained on all patients after at least 3 months poststroke.

Six patients began receiving the laser acupuncture treatments during the chronic phase poststroke (10 months to 6.5 years). These times are beyond the spontaneous recovery period of up to 6 months poststroke (4, 5). One hand paresis case began receiving treatments during the acute phase poststroke (1 month poststroke). Because all patients were beyond the spontaneous recovery period except for one, each patient served as his/her own control. No sham laser treatments were administered. None of the stroke patients was receiving physical therapy or occupational therapy treatments during the course of the laser acupuncture treatments.

**Method:**

A 20 mW Gallium Aluminum Arsenide (780 nm) near-infrared, diode laser (Uni-laser, Denmark) with 1 mm diameter aperture, was used for 20-40 seconds (51-103 J/cm<sup>2</sup>) on each acupuncture point. The laser was used for 20 seconds on shallow points (hands and face), and 40 seconds on deeper acupuncture points (arms and legs). The points used on the paralyzed arm included: LI 4 (Hegu), LI 11 (Quchi), LI 15 (Jiayu), TW 5 (Waiguan), TW 9 (Sidu), and three distal Baxie points in the web-spaces between the fingers. The points used on the paralyzed leg included: ST 31 (Biguan), ST 36 (Zusanli), GB 34 (Yanglingquan), GB 39 (Xuanzhong), and LIV 3 (Taichong). Points used on the non-paralyzed side included LI 4 (Hegu) and ST 36 (Zusanli). These points include some of those used in our previous research where needle acupuncture was used to treat paralysis in stroke patients (1-3). If facial paralysis was present, the following points on the paralyzed side were used: ST 4 (Dicang), ST 6 (Jiache), ST 7 (Xiaguan), LI 20 (Yingxiang), and SI 18 (Quanliao).

The patients were tested a few days prior to the first laser acupuncture treatment, and within a few days after completing the 20th, 40th and/or 60th laser acupuncture treatment. P.T. and O.T. testers were blinded; testers were part of a needle acupuncture study with real or sham or no acupuncture. Some patients received only 20 or 40 treatments. The number of treatments a patient received (20, 40 or 60) was based solely on patient availability and transportation issues. All patients were offered a maximum of 60 laser treatments. The patients were treated 2 - 3 times per week, for 3 - 4 months. For patients with arm/leg paralysis, improvement was defined as a minimum increase of at least 10% isolated active range of motion, on at least one arm/leg test, following 20, 40 or 60 laser acupuncture treatments. For the patients treated for hand paresis, improvement was defined as an increase of at least 1 lb., on at least one hand strength test, following 20, 40 or 60 laser acupuncture treatments.

**Results:**

Overall, 5/7 patients (71.4%) treated with laser acupuncture showed improvement. Four of the six chronic stroke patients (66%) showed improvement. The single acute stroke patient (hand paresis case) also showed improvement. Three of the five arm/leg cases showed a minimum of at least 10% improvement in isolated active range of motion on knee flexion; knee extension and/or shoulder abduction (range, +11 to +28%; mean, +15.8%, S.D., 7.08).

The two cases with hand paresis each showed improvement in hand strength. For the chronic hand paresis case (33 months poststroke), grip strength, pre-treatment, 62.7 lbs., post- 20 treatments, 68.4 lbs; strength in first 2 fingers opposing thumb (3-Jaw Chuck), pre- 12, post- 18 lbs.; strength in index finger opposing thumb (Tip Pinch), pre-8, post- 11 lbs; and strength in

thumb opposing the lateral surface of index finger (Lateral Pinch) pre- 12, post- 14 lbs. For the acute hand paresis case (starting at 1 month poststroke), grip strength, pre- 32.2, post- 20 Tx.'s, 47.7 lbs.; 3-Jaw Chuck, pre- 0, post-11.3 lbs.; Tip Pinch, pre- 0, post- 10.7 lbs; Lateral Pinch, pre- 3.7, post- 14.7 lbs.

The five cases who showed improvement following the laser acupuncture treatments had either no lesion in, or lesion in less than half of the motor pathway areas, including the periventricular white matter (PVWM) area on CT scan. The PVWM area is located adjacent to the body of the lateral ventricle, superior to the posterior limb, internal capsule. The two arm/leg cases who showed no improvement following the laser acupuncture treatments had lesion in more than half of the motor pathway areas, including the PVWM area. These behavioral and neuroanatomical findings are similar to our previous research using needle acupuncture to treat paralysis in stroke patients.

The PVWM area appears to be the most important area to examine on CT scan or MRI scan, in understanding whether a stroke patient is likely to benefit from needle or laser acupuncture to help reduce the severity of paralysis. This area contains many important intra- and inter-hemispheric pathways including, in part: 1) The descending pyramidal fibers from motor cortex, where the pathways for the leg are more medial. 2) The body of the caudate nucleus. 3) The mid-callosal pathways. 4) The medial subcallosal fasciculus containing connections to caudate from supplementary motor area and cingulate gyrus. 5) The occipito-frontal fasciculus. 6) The superior lateral thalamic peduncle which includes projections from dorsomedial nucleus and anterior nucleus to cingulate and projections from the ventrolateral nucleus to motor cortex.

Thus, even within this small PVWM region there are numerous motor systems that might, if incompletely damaged, respond to needle or laser acupuncture. These systems include dorsal striatum, supplementary motor area, or the frontal-striatal-ventrolateral thalamic-frontal loop, as well as the descending pyramidal system.

One patient with severe arm/leg paralysis did have improvement in her facial paralysis with good control of food and liquids in the left side of her mouth for the first time poststroke (4 years poststroke). She also improved in walking, with a "loosening" of the left Achilles tendon.

The author has observed that red-beam laser stimulation (4.59 J/cm<sup>2</sup>) on the Jing-Well points on the fingers (LU 11, Shaoshang; LI 1, Shangyang; PC 9, Zhongchong; TW 1, Guanchong; HRT 9, Shaochong; SI 1, Shaoze), in combination with the use of a microamps TENS device (MicroStim 100 TENS, Tamarac, FL) placed on the hand (HRT 8, Shaofu; and TW 5; Waiguan), is helpful in treating hand paresis and reducing hand spasticity in stroke patients (6, p. 40, Naeser Laser HAND Treatment Program). This method is also helpful in the prevention/ reduction of contractures of the hand, in patients with severe hand paralysis (personal observation).

#### **Discussion:**

The use of low-level laser for long-term treatment is especially desirable for chronic stroke patients with hand paresis. The patient can be trained to treat him/herself at home, using an inexpensive 5mW red-beam diode, laser pointer and a microamps TENS device (MicroStim 100, Tamarac, FL). See Websites listed below. Acupuncture studies using needle acupuncture have observed the best outcome levels when acupuncture treatments were initiated at less than 3 months poststroke (7, 8), and especially when the acupuncture treatments were initiated at less than 24 hours and 36 hours poststroke (9, 10).

This is the first study to examine the effect of low-level laser therapy on acupuncture points to treat paralysis in stroke patients where lesion location was known for each patient. Results suggest that low-level laser therapy on acupuncture points is effective to help reduce the severity of paralysis in stroke patients, especially those with mild-moderate paralysis. The treatments should be initiated as soon as possible poststroke, even within 24 hours poststroke. A

comprehensive rehabilitation program of P.T., O.T. plus needle and/or laser acupuncture is recommended.

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#### Additional Information:

[www.Acupuncture.com/Acup/Naeser.htm](http://www.Acupuncture.com/Acup/Naeser.htm) and [www.Acupuncture.com/Acup/laser.htm](http://www.Acupuncture.com/Acup/laser.htm)

See also: Naeser MA: *Neurological Rehabilitation: Acupuncture and Laser Acupuncture to Treat Paralysis in Stroke and Other Paralytic Conditions and Pain in Carpal Tunnel Syndrome*. Chapter in National Institutes of Health Consensus Development Conference on Acupuncture sponsored by the Office of Alternative Medicine and the Office of Medical Applications of Research. Bethesda, MD, November 3-5, 1997. pp. 93-109

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#### Protective Effect Of Low-Level Laser Irradiation On Acupuncture Points Combined With Iontophoresis Against Focal Cerebral Ischemia-Reperfusion Injury In Rats

[Article in Chinese]

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**OBJECTIVE:** To investigate the effects of low-level laser irradiation on acupuncture points combined with iontophoresis against brain damage after middle cerebral artery occlusion (MCAO) in rats.

**METHODS:** Sixty-nine SD rats were randomly divided into five groups, including normal group, sham operation group, model group, electro-acupuncture group and low-level laser irradiation on acupuncture points combined with iontophoresis group (LLLI group). The cerebral ischemia-reperfusion (I/R) model was established by thread embolism of middle cerebral artery. The rats in the LLLI group, as well as the electro-acupuncture group were given treatment as soon as the occlusion finished (0 hour) and 12, 24 hours after the occlusion. We observed the changes of neurological deficit scores and the body weight of the rats at different time. The activity of superoxide dismutase (SOD) and the content of malondialdehyde (MDA) in the rats brain tissue were tested.

**RESULTS:** The neurological deficit score of the LLLI group was significantly lower than that of the model group. The body weight and the activity of SOD of the rats decreased slightly, and the content of MDA decreased significantly after the treatment.

**CONCLUSION:** The low-level laser irradiation on acupuncture points combined with iontophoresis can prevent focal cerebral ischemia-reperfusion injury. One of its mechanisms may be increasing the activity of SOD and decreasing the damage of the oxidation products to the body.

