

## CATEGORY / APPLICATION – NEUROLOGICAL TOPIC – CARPAL TUNNEL SYNDROME

### The effectiveness of Low Level Laser Therapy on Carpal Tunnel Syndrome

Steven Balmes. Yolanda Cooper. Olabisi Jarrett. Bobby Kennedy, Jr.

*Presented at WALT (World Association of Laser therapy) Annual Conference (2000) Athens, Greece.*

Carpal Tunnel Syndrome (CTS) is a debilitating musculoskeletal disorder, decreasing hand function and quality of life. Patients with CTS often complain of numbness and tingling during the day, waking at night, weakness and pain in hands and wrist. There are numerous treatment options available, including surgery, splinting, and steroid injections. However, no single treatment is consistently effective. The use of Low Level laser Therapy (LLLT) as a noninvasive, painless, and cost effective treatment technique for CTS is becoming popular in physical therapy worldwide. However, compelling evidence to support its efficacy does not exist yet. The purpose of this study is to assess the physiological effects of LLLT (LASERPATHT) in reducing any or all the signs and symptoms of CTS under placebo-controlled, double-blind conditions.

Twenty participants (33 hands) were randomly assigned to one of two groups: LLLT for 4 min/day (dosage=5.184 J/cm<sup>2</sup>) or a placebo for 4 min/day (dosage=0 J/cm<sup>2</sup>), for an average of 15 (range 11 to 18) weekday treatments. Each participant was assessed by a standardized CTS questionnaire, 2) grip strength, 3) pinch strength, 4) median nerve sensory and motor distal latencies, prior to treatment, reassessed after the final treatment, and at the one month follow-up. Sensory and motor median nerve distal latencies were measured weekly, in addition to the above mentioned. Eighteen participants (30 hands) completed the study, and 11 participants (23 hands) made it to the one-month follow-up.

Data analysis was conducted using repeated measures (ANOVA) and a Kruskal-Wallis Test. The results indicated that there was a statistically significant decrease in median nerve sensory distal latency in the laser group compared to a placebo from pre-test to post-test; however, no statistical significance was found for the other five variables measured. There was a decrease in symptoms and an increase in functional status in both groups. Analysis of grip strength showed no statistical significance, although a slight decrease in placebo group and a slight increase in the laser group was observed. There was no difference within or between groups for pinch strength.

**The results of this study suggest that LLLT may effectively decrease sensory distal latency of the median nerve and improve nerve function.** The five remaining variables were not found to show statistically significant changes between groups. Verbal reports of improvement from the participants differed from the results of the CTS questionnaire. The researchers believe that LLLT is a beneficial alternative treatment for CTS when considering the participant's verbal reports and improvement in nerve function.

## Treatment of repetitive use carpal tunnel syndrome

Smith CF. Vangness CT. Anderson T. & Good W. (1995)

*Proceedings SPIE* (1995) 2395; 658-661.

In 1990, a randomized, double-blind study was initiated to evaluate the use of an eight-point conservative treatment program in carpal tunnel syndrome. A total of 160 patients were delineated with symptoms of carpal tunnel syndrome. These patients were then divided into two groups. Both groups were subjected to an ergonomically correct eight-point work modification program. A counterfeit LLLT unit was used in Group A, while an actual LLLT unit was used in Group B. Groups A and B were **statistically significantly different in terms of return to work, conduction study improvement, and certain range of motion and strength studies.**

## Noninvasive laser neurolysis in carpal tunnel syndrome

Weintraub MI, MD, FACP

*Muscle Nerve* (1997) 20:1029-1031.

The peripheral nervous system is photosensitive providing the scientific rationale for this study, which determines the efficacy and safety of laser light exposure in 30 cases with CTS. Nine joules of energy over 5 points (7-15 treatments) **reversed CTS in 77% of cases with three-fold normalization of CMAP. A photobiologic response was seen in 80% of nerves. This unique and novel approach is cost-effective and will play a role in future management of CTS.**

## A pilot study to determine effectiveness of low level photon therapy for chronic Carpal Tunnel Syndrome "CTS"

Salansky N

*Presented at the Lasers in Surgery and Medicine conference* (1994) Vol. 16.

**Objective:** The purpose of this study was to determine the potential effectiveness of LEPT for the treatment of chronic CTS.

**Methods:** Twenty-one patients (aged 28-66 years) with chronic CTS were admitted for the study and provided treatments 3 times per week with 15 treatments as one course. **Results:** a) 15 (71.4%) patients obtained complete symptom relief and returned to their regular work; b) 2 (9.5%) patients obtained partial symptom relief (at least one evaluation criteria was negative on final measurement); c) 4 (19.1 %) patients did not respond.

**The 15 cured patients remained symptom-free with follow-up interviews ranging from 3 -18 months after therapy. Overall, this study was considered successful related to using LEPT to resolve symptoms of chronic CTS.**

Smith CF & Vangsness CT

## **Future of laser biostimulation in America today: Microlight 830**

*Proceedings SPIE* (1992) 1643; 275-276.

For the last 2 years, we have been investigating the use of an 830 nm laser for **LLLT** in chronic pain syndromes. The laser output does not exceed 100 mW. This wavelength has been carefully selected to be in the 'window' of wavelengths between 650 and 900 nm. At this level, the laser energy will penetrate the epidermis, the dermis and the subcutaneous layers to the deep tissue. The tissue effect of this laser energy is not thermal but rather a stimulation of micro-circulation with a secondary effect of blocking pain enzymes and activation of the synthesis of endorphin enzymes. We have experience with approximately 75 patients who have been treated with **LLLT**. We used a double-blind study at several General Motors facilities in Michigan to determine the effectiveness of **LLLT** in inflammatory conditions. Repetitive injuries in the work place have moved from 18% of industrial accidents in 1981 to 52% in 1989. Carpal Tunnel Syndrome is the number one economic problem in occupational medicine; 15% of employees of American automotive plants have Carpal Tunnel Syndrome. This large number of patients have been treated in the past by standard physiotherapy treatment modalities and ultimately by surgery for failure of conservative therapy. Incidence of 'return to work activities' has been low. **LLLT affords a positive solution to this problem not only therapeutically but prophylactically. Indications for treatment are Chronic Pain Syndrome and Carpal Tunnel Syndrome of mild to moderate degree.**

## **Carpal tunnel syndrome: clinical outcome after LLLT-acupuncture, microamps TENS, and other alternative therapies: an open protocol study.**

Branco K, Naeser MA

*Journal of Alternative Complementary Medicine* (1999) 1 :5-26.

Acupuncture Healthcare Services, Westport, Massachusetts, USA. They measured outcome for carpal tunnel syndrome (CTS) patients (who previously failed standard medical/surgical treatments) treated primarily with a red-beam, **LLLT-AP** and microamps TENS on the affected hand; secondarily, with other alternative therapies. **Design:** Open treatment protocol, patients diagnosed with CTS by their physicians. Treatment was given by licensed acupuncturist in a private practice office. 36 hands were treated (from 22 women, 9 men), ages 24-84 yr, median pain duration) 24 mo. Fourteen hands had failed 1-2 surgical release procedures. Primary treatment: red- beam, 670 nm, continuous wave, 5 mW, diode **LLLT** pointer (1-7 J per point), and microamps TENS (<900 uA) on affected hands. Secondary treatment: infrared **LLLT** (904 nm, pulsed, 10 W) and/or needle AP on deeper acupoints; Chinese herbal medicine and supplements, on a case-by-case basis (3 treatments/wk for 4-5 wk). Pre- and post-treatment Melzack pain scores and profession and employment status were recorded. Post-treatment, pain significantly reduced ( $p < .0001$ ), and 33/36 hands (91.6%) had no pain, or pain reduced by >50%. Fourteen hands that failed surgical release were successfully treated. Patients remained employed, if not retired. Follow-up after 1-2 yr with cases aged <60, only 2/23 hands (8.3%) had return of pain, but were successfully re-treated within a few weeks. Possible mechanisms for effectiveness include increased adenosine triphosphate (ATP) on cellular level, decreased inflammation) temporary increase in serotonin. **Combined treatment with LLLT-AP + microamp TENS + Chinese herbs has potential cost-savings (current estimated cost per case) \$12,000; this treatment, \$1,000. It is safe when applied by a licensed acupuncturist trained in laser-AP; supplemental home treatments may be performed by patient under supervision of acupuncturist.**

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## Successful management of female office workers with "repetitive stress injury" or "carpal tunnel syndrome" by a new treatment modality- application of low level laser

E. Wong G LEEJ. Zu CHERMAN and D. P. MASON Western Heart Institute and St. Mary's Spine Center, St. Mary's Medical Center. San Francisco. CA. USA and Head and Neck Pain Center, Honolulu HL USA

Abstract. Female office workers with desk jobs who are incapacitated by pain and tingling in the hands and fingers are often diagnosed by physicians as "repetitive stress injury" (RSI) or "carpal tunnel syndrome" (CTS). These patients usually have poor posture with their head and neck stooped forward and shoulders rounded; upon palpation. they have pain and tenderness at the spinous processes C5 -T1 and the medial angle of the scapula. In 35 such patients we focused the treatment primarily at the posterior neck area and not the wrists and hands. A low level laser ( 100 m W) was used and directed at the tips of the spinous processes CS -T1. The laser rapidly alleviated the pain and tingling in the arms, hands and fingers. and diminished tenderness at the involved spinous processes. Thereby, it has become apparent that many patients labeled as having RSI or CTS have predominantly cervical radicular dysfunction resulting in pain to the upper extremities which can be managed by low level laser. Successful long-term management involves treating the soft tissue lesions in the neck combined with correcting the abnormal head, neck and shoulder posture by taping. cervical collars, and clavicle harnesses as well as improved work ergonomics. Manuscript received: July, 1997 Accepted for publication: September, 1997 LASER THERAPY , 1997:9: 131- 136 09197 Rep. US \$ 10-12-14 ~ 1997 by LT Publishers, U.K, Ltd



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### Patient Success Stories The Clinical Application of Advancements in Orthopaedic Research

#### Case 2: RETURNING TO THE LINE, EVEN WITH CARPAL TUNNEL SYNDROME

A fifty-year old worker at the Flint, MI General Motors Assembly Plant had dropped out of high school due to his father's death. He began work as a "lineman," and then became an active union organizer. During his thirty-five years at General Motors, he rose to the rank of Union Steward and shift foreman. His overall pay package reached \$55 per hour. He was asked to work at a repetitive overhead "bolting" job, which he accepted because it brought a 10% raise in salary. Subsequently, he learned from his wife, who works in the G.M. Medical Director's office, that 15% of all General Motors' workers suffer from Carpal Tunnel Syndrome. To his dismay, he noted that essentially all overhead assembly line workers develop Carpal Tunnel Syndrome, and he did, too! When the Medical Director told him that almost no workers remained at their current work after surgery, he chose to be treated with the

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recently approved 830nm low level laser therapy. With this new, non-invasive treatment, administered intermittently, he was able to continue to work and preserve his \$60 per hour job. He is now thankful to be able to give his four children the education he never had.

## **Case 3: CARPAL TUNNEL SYNDROME WON'T STOP THIS PRE-MED MAJOR!**

A nineteen-year-old, first year, pre-med major at the local university had to work to pay for nearly all of her educational expenses. She worked not only twenty hours per week as a court reporter, but also worked at Microsoft in Computer Analysis. The forty-hour work week, in addition to her studies, made it difficult to maintain a GPA that would be acceptable for admission to Harvard Medical School. She was constantly trying to juggle her work schedule and needed the income from a full-time summer job to finance her studies. When June flowers blossomed with the arrival of summer, a painful numbness in her index, middle, and ring fingers accompanied the arrival of the season. The recommended surgical treatment would have toppled her financial plans and delayed her college and medical school career .

Fortunately, a friend's mother, who was an occupational engineer, suggested work computer modification and the new, non-invasive, low-level laser therapy. This 830nm laser had been recently approved by the FDA for treatment of Carpal Tunnel Syndrome. After only a few treatments, the swelling in the nine tendons of each wrist diminished and the pressure on the median nerves eased, and the painful numbness subsided. Simple, easy, inexpensive treatment, no surgery and no work stoppage. Even the very young can experience the debilitations of CTS.

Contact: Kathy Pontzer, AAOS Washington Office (202) 546-4430; Prepared by Caryn Prosansky, MA with submissions from George Muschler, MD, Chadwick Smith, MD, Robert P. Mack, MD, Lew C. Schon, MD.

## **Carpal tunnel syndrome pain treated with low-level laser and microamperes transcutaneous electric nerve stimulation: A controlled study.**

**Naeser MA, Hahn KA, Lieberman BE, Branco KF.**

Department of Neurology, Boston University School of Medicine, Psychology Research Service, MA, USA. mnaeser@bu.edu

**OBJECTIVE:** To investigate whether real or sham low-level laser therapy (LLLT) plus microamperes transcutaneous electric nerve stimulation (TENS) applied to acupuncture points significantly reduces pain in carpal tunnel syndrome (CTS). **DESIGN:** Randomized, double-blind, placebo-control, crossover trial. Patients and staff administered outcome measures blinded.

**SETTING:** Outpatient, university-affiliated Department of Veterans Affairs medical center. **PARTICIPANTS:** Eleven mild to moderate CTS cases (nerve conduction study, clinical examination) who failed standard medical or surgical treatment for 3 to 30 months. **INTERVENTION:** Patients received real and sham treatment series (each for 3-4wk), in a randomized order. Real treatments used red-beam laser (continuous wave, 15mW, 632.8nm) on shallow acupuncture points on the affected hand, infrared laser (pulsed, 9.4W, 904nm) on deeper points on upper extremity and cervical paraspinal areas, and microamps TENS on the affected wrist. Devices were painless, noninvasive, and produced no sensation whether they were real or sham. The hand was treated behind a hanging black curtain without the patient knowing if devices were on (real) or off (sham). **MAIN OUTCOME MEASURES:** McGill Pain Questionnaire (MPQ) score, sensory and motor latencies, and Phalen and Tinel signs.

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**RESULTS: Significant decreases in MPO score, median nerve sensory latency, and Phalen and Tinel signs after the real treatment series but not after the sham treatment series. Patients could perform their previous work (computer typist, handyman) and were stable for 1 to 3 years. CONCLUSIONS: This new, conservative treatment was effective in treating CTS pain;** larger studies are recommended.

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