

# Carpal Tunnel Syndrome Treated with a Diode Laser: A Controlled Treatment of the Transverse Carpal Ligament

Wen-Dien Chang, M.S.,<sup>1,2</sup> Jih-Huah Wu, Ph.D.,<sup>3</sup> Joe-Air Jiang, Ph.D., P.E.,<sup>1</sup>  
Chun-Yu Yeh, Ph.D.,<sup>4</sup> and Chien-Tsung Tsai, M.S.<sup>2</sup>

## Abstract

**Objective:** The purpose of this placebo-controlled study was to investigate the therapeutic effects of the 830-nm diode laser on carpal tunnel syndrome (CTS). **Background Data:** Many articles in the literature have demonstrated that low-level laser therapy (LLLT) may help to alleviate various types of nerve pain, especially for CTS treatment. We placed an 830-nm laser directly above the transverse carpal ligament, which is between the pisiform and navicular bones of the tested patients, to determine the therapeutic effect of LLLT. **Materials and Methods:** Thirty-six patients with mild to moderate degree of CTS were randomly divided into two groups. The laser group received laser treatment (10 Hz, 50% duty cycle, 60 mW, 9.7 J/cm<sup>2</sup>, at 830 nm), and the placebo group received sham laser treatment. Both groups received treatment for 2 wk consisting of a 10-min laser irradiation session each day, 5 d a week. The therapeutic effects were assessed on symptoms and functional changes, and with nerve conduction studies (NCS), grip strength assessment, and with a visual analogue scale (VAS), soon after treatment and at 2-wk follow-up. **Results:** Before treatment, there were no significant differences between the two groups for all assessments ( $p > 0.05$ ). The VAS scores were significantly lower in the laser group than the placebo group after treatment and at follow-up ( $p < 0.05$ ). After 2 wk of treatment, no significant differences were found in grip strengths or for symptoms and functional assessments ( $p > 0.05$ ). However, there were statistically significant differences in these variables at 2-wk follow-up ( $p < 0.05$ ). Regarding the findings of NCS, there was no statistically significant difference between groups after treatment and at 2-wk follow-up. **Conclusions:** LLLT was effective in alleviating pain and symptoms, and in improving functional ability and finger and hand strength for mild and moderate CTS patients with no side effects.

## Introduction

CARPAL TUNNEL SYNDROME (CTS), a neural disease, is caused when the median nerve is entrapped by an inflamed and swollen transverse carpal ligament from above as it goes through the carpal tunnel, along with the tendons of the hand and fingers.<sup>1</sup> A thickening transverse carpal ligament due to chronic inflammation and swelling is the major source of CTS and causes entrapment of the nerve and the consequent pain and possible paralysis. Clinical symptoms and signs include numbness and tingling of the first three fingers and radial side of the ring finger, nocturnal awakening due to pain, and impaired fine motor control because of weakness of the hand.<sup>2</sup> Electromyographic and

physical examinations (i.e., Phalen's maneuver and Tinel's test), can be used to confirm the diagnosis. Neural paralysis due to diabetes mellitus or other metabolic problems should be ruled out.<sup>3</sup> Symptoms are usually caused by high pressure on the median nerve in the carpal tunnel, rather than to damage to the nerve. Factors leading to inflammation and swelling of the carpal ligaments include trauma to the wrist, rheumatoid arthritis, operating vibrating machines by hand, tasks requiring repetitive wrist movements, and wrist edema during pregnancy.<sup>1</sup> Previous studies have proven that repetitive and forceful movements of the hand and wrist may lead to CTS.<sup>4</sup> Due to their smaller carpal tunnels, three times as many women suffer from CTS than do men.<sup>4</sup> Mayo found that 7 h of repetitive typing may increase the risk of CTS.<sup>5</sup>

<sup>1</sup>Department of Bio-Industrial Mechatronics Engineering, National Taiwan University, Taipei, <sup>2</sup>Department of Rehabilitation Medicine, Da Chien General Hospital, Miaoli, <sup>3</sup>Department of Biomedical Engineering, Ming Chuan University, Taipei, and <sup>4</sup>Department of Physical Therapy, Chun Shan Medical University, Taichung, Taiwan.