

**Senior Research Study Paper:
The Effects of Laser Acupuncture on Handgrip Strength**

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Abstract

Background: Loss of grip strength affects many people daily decreasing their quality of life and can be linked to chronic conditions. 635nm Qi Pulse Laser was developed for acupuncture treatments to decrease treatment time and offer the option of needless acupuncture. The Handgrip Dynamometer measures the grip strength of patients in pounds.

Methods: Student participants from Logan College of Chiropractic between 18-35 years of age were treated bilaterally on a variety of assigned acupuncture points located on the forearm, wrist and hand. Pre and post grip strength was taken on each participant using the Handgrip Dynamometer measuring their grip in pounds.

Results: After treatment of six acupuncture points with the 635nm Qi Pulse Laser, the test group participants had positive changes. For the right hand, Female participants had an average increase of 3.7 pounds post treatment and Male participants had an average increase of 3.0 pounds post treatment. For the Left hand, Female participants had an average increase of 4.6 pounds post treatment and Male participants had an average increase of 5.1 pounds post treatment.

Conclusions: The acupuncture treatment with the 635nm Qi Pulse Laser did have positive results for both male and female participants. The results appeared to show an improvement but further study is needed. For a more consistent and accurate measurement on the Dynamometer patients, they should have their arms at 90° of elbow flexion and 90° of shoulder flexion or straight out in front of them on both pre and post measurements. To help assist in keeping the patients arm in the correct position a brace or template could be used during the measurements. There was no report of negative side effects from any of the participants in the study.

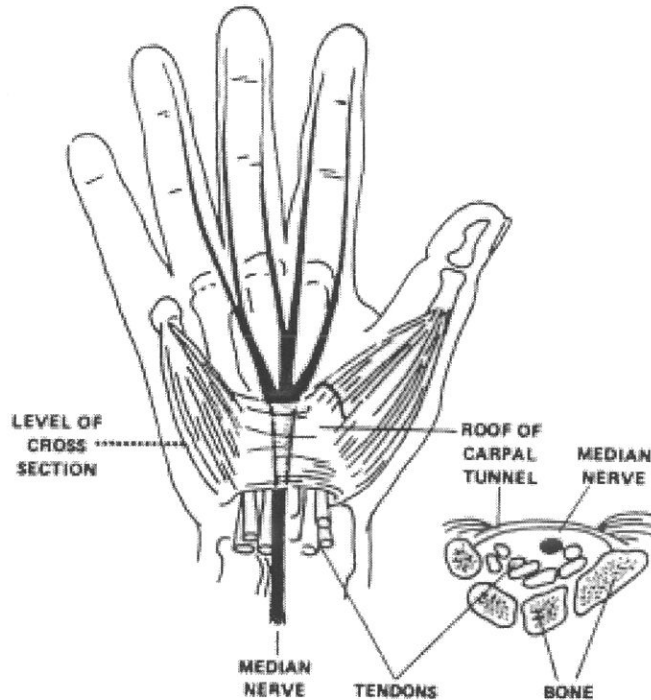
Key Words: *Grip strength, dynamometer, Qi Pulse laser, acupuncture, carpal tunnel*

Introduction:

Carpal Tunnel Syndrome or CTS, is the entrapment of the Median nerve at the wrist. The median nerve is formed from parts of the medial and lateral cords of the brachial plexus and continues down the arm to enter the forearm with the brachial artery. It originates from the brachial plexus with roots from C6, C7, C8, & T1. The median nerve is the only nerve that passes through the carpal tunnel, where it may be compressed to cause carpal tunnel syndrome.

The carpal tunnel consists of the transverse carpal ligament and nine flexor tendons, which surround the median nerve as it passes through the wrist and palm area. Compression of this area can be from many different things, but most commonly from repetitive stress such as typing or condensing the wrist, leading to carpal tunnel syndrome.^{2, 14, 16} CTS occurs from constant pressure on the Median nerve at the wrist. People suffering from CTS typically present with pain in the wrist that radiates into the hand and occasionally the forearm. Numbness and tingling in the thumb, index and middle finger, and also weakness in the hand can also be present.

CTS occurs more commonly in workers whose tasks include repetitive hand movements that condense the wrist such as keyboard operators, hair dressers, chiropractors, and cashiers to name a few.¹⁶ Carpal tunnel syndrome is the most common nerve compression disorder of the upper extremity. This process affects 1 percent of the general population and 5 percent of the working population who must undergo repetitive use of their hands and wrists in daily living



There are various methods of treatment for CTS, some more successful than others. Treatment options consist of abstinence, corticosteroids, chiropractic/physical therapy, acupuncture and surgery. In work-related CTS, a trial of abstinence from activities which

aggravate the symptoms is tried, as well as analysis of work habits and tools. The goal is to decrease exposure to provocative actions through patient education, as well as through the appropriate ergonomic changes in the worksite area.¹⁹ The wrist may also be splinted in a neutral position, especially at night and during activities that lead to aggravation of the symptoms. Direct injection of steroids into the carpal tunnel may also provide temporary relief. After 2 to 4 months, 65-90% of patients can be expected to have their symptoms reoccur. It is also noted in a study by Gelberman, Aronson and Weisman that 18 months after injection of a steroid, only 22% of patients were still symptom free.^{16, 18}

Chiropractic joint manipulation and mobilization of the wrist and hand, stretching and strengthening exercises, soft-tissue mobilization techniques, and even yoga can be helpful. Chiropractors can also recommend supplementation as treatment, such as with B vitamins. In several research studies, vitamin B6 deficiency has been associated with carpal tunnel syndrome. A study by the Portland Hand Surgery and Rehabilitation Center in Oregon examined 441 people and found that higher levels of vitamin B6 were associated with fewer carpal tunnel syndrome symptoms. Researchers also found that higher levels of vitamin C relative to lower vitamin B6 levels were associated with a higher prevalence and greater frequency of carpal tunnel symptoms. A Japanese study of 174 university students found that students with lower levels of vitamin B6 showed symptoms of carpal tunnel syndrome. Food Sources of vitamin B6 include sweet potatoes, avocados, brown rice, sunflower seeds, chick peas, salmon, pork, chicken, turkey, potatoes, bok choy, barley, bananas, and mangoes.

*Needs
references*

Surgical treatment for carpal tunnel syndrome is the most frequent surgery of the hand and wrist, with 463,637 carpal tunnel releases annually in the United States, accounting for \$1 billion in direct costs.²⁰

During open carpal tunnel release surgery, the transverse carpal ligament is cut, which releases pressure on the median nerve and relieves the symptoms of carpal tunnel syndrome. An incision is made at the base of the palm of the hand. This allows the doctor to see the transverse carpal ligament. After the ligament is cut, the skin is closed with stitches. The gap where the ligament was cut is left alone and eventually fills up with scar tissue. Carpal tunnel surgery has about a 57% failure rate following patients from 1-day to 6-years. At least one of the following symptoms re-occurred during this time: Pain, Numbness, Tingling sensations.²¹

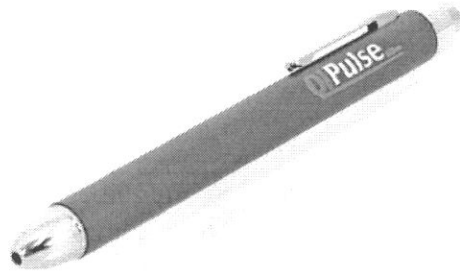
Oftentimes, the surgery fails to produce any lasting help. A published study by Dr. Strasberg, at the Washington University School of Medicine, reported some startling results. This study, involving patients requiring a second surgery for CTS, revealed that only 53% of the patients showed significant improvement in their symptoms. Another study produced by the Washington School of Public Health and Community Medicine showed that relief from pain was complete or modest in 86% of the patients. Of the patients studied, only 67% were able to return to their old jobs whereas, 15% had to change jobs and the remainder did not return to work.

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Acupuncture is a form of treatment used in both Traditional and Classical Chinese Medicine. Acupuncture is based on the principle that there are energetic pathways, or channels, throughout the body that influence associated internal organs and structures. Energy from these pathways surfaces at various points on the body, identified as acupuncture points. Each of these acupuncture points serves as a tunnel, or access route, to the deeper circulatory channels within.

Extremely fine gauge needles are inserted at selected points, stimulating these points and thereby activating the body's natural healing abilities.⁷ While most people think of needles when they hear acupuncture, they are not aware that the specific points can also be treated using a low level laser.^{3,4,5,6} Low-level lasers are still considered investigational in the United States.

Biostimulation lasers, also called low level laser therapy (LLLT), cold lasers, soft lasers, or laser acupuncture devices, were cleared for marketing by FDA through the Premarket Notification/510(k) process as adjunctive devices for the temporary relief of pain. These clearances were based on the presentation of clinical data to support such claims. FDA will consider similar applications for these and other claims with the decision to require clinical data being made on an individual basis, taking into consideration both the device and the claim. It has been shown that low-level lasers can be effective, but their optimal treatment parameters are not known.^{1,3,9,12,17}



Qi Pulse 635 nm laser

Tina Karu, PhD, of the Laser Technology Center in Russia and affiliated with the University of California at Berkley, has researched the effects of light on the cell since the 1980s. She found there are photo receptors at the molecular level that, when triggered, activate a number of biological reactions such as DNA/RNA synthesis, increased cAMP levels, protein and collagen synthesis, and cellular proliferation. The result is rapid regeneration, normalization, and healing of damaged cellular tissue. Thus, light is a trigger for the rearrangement of cellular metabolism.^{8,9,10,11,13,17} Low-level laser acupuncture involves the application of photic energy to acupuncture points/tissues with the objective of augmentation of the normal healing process and/or pain relief. The lasers that are commonly used for acupuncture are able to penetrate most deeply because of their wavelength level and the low absorption in the principal constituent in soft tissues, water.¹⁷

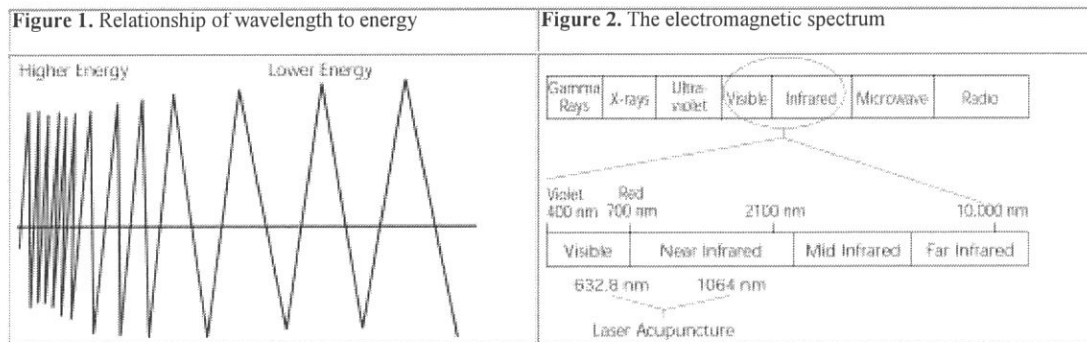


Figure 1 shows how the wavelength of low level energy lasers compares to that of higher energy lasers. Figure 2 shows which part of the spectrum of light that the low level lasers fall under, with the low level being on the end of the 632.8nm visible spectrum.

Materials and Methods

Subjects

All participants were from the Logan College of Chiropractic student population. Students were currently enrolled in ASP or trimesters 1-10 who participated. All subjects signed consent forms to participate in the study, and also completed inclusion criteria questioners. Data was collected from 20 participants in the study. The participants were 10 females and 10 males. Their approximate age range was 20-35. Participants had no prior wrist surgery. They had no current medical diagnosis of Carpal Tunnel Syndrome and/ or Rheumatoid Arthritis. However, individuals experiencing Carpal Tunnel Syndrome “like” symptoms with no medical diagnosis were permitted to participate. Individual’s, who had previously experienced a break or fracture of their wrist, forearm, or hand, were excluded from participation. Participants were not pregnant during the time of the study, or have given birth to a child within the six months prior to study participation. Children, prisoners, individuals with known developmental disabilities, and terminally ill patients were not permitted to participate in the study. During treatment Dan Geisler and Dillon Kaesberg who have obtained 200 hr acupuncture certification performed all Acupuncture. All data was collected and recorded by Dierdra Robison.

Materials used include one Handgrip Dynamometer and two 635nm Qi Pulse Lasers. The Handgrip Dynamometer was used to measure the participants grip strength in pounds pre and post treatment. Every participant was treated one time bilaterally on an assigned set of acupuncture points for fifteen seconds per point with the 635nm Qi Pulse. The acupuncture points treated in this study included Triple Warmer 5, Large Intestine 4, Lung 7, Heart 9, Small Intestine 6, and Pericardium 7. Dierdra Robison recorded the pre and post hand grip strengths and monitored both the questioners and consent to treat forms. Dan Geisler and Dillon Kaesberg used the 635nm Qi Pulse Laser to treat the assigned acupuncture points on each patient.

Grip Strength Measurement and Recording

The participants had their grip strength measured by using a grip strength dynamometer before and after treatment to determine a correlation between the treatment and an increase in grip strength readings. **Both hands of the participants were tested, with 1 grip measurement pretreatment and 1 grip measurement post treatment.** All participants participated in one treatment on one day. The time commitment for participants was approximately 30 minutes in duration. The measurements were taken immediately prior to laser acupuncture treatment and immediately post laser acupuncture treatment.

Data and Statistical Analysis

Data consisted of grip strength measurements before acupuncture treatment on the right and left hand as well as post acupuncture treatment grip strength measurements on the right and left hand.

The variables in the study include an increase or decrease measurement on both the right and the left. This was calculated by measuring the difference between the pre and post treatment on each side. A positive measurement shows that there was an increase in grip strength for that subject following laser acupuncture treatment, and a negative measurement shows there was a decrease in grip strength following laser acupuncture treatment.

An average was then calculated for the four different categories of measurement. Female Right Difference, Female Left Difference, Male Right Difference, and Male Left Difference.

Results and Data

The data collected although simple and minimal was able to show us; that while some individuals did experience a decrease in grip strength post laser acupuncture treatment, the overall average of post treatment data for males and females displayed an increase post laser acupuncture treatment.

Female Data Collection

Table 1

	Pre Tx Right	Pre Tx Left	Post Tx Right	Post Tx Left	After Tx Difference Right	After Tx Difference Left
Female 1	70	67	75	75	+5	+8
Female 2	65	55	60	60	-5	+5
Female 3	80	70	75	80	-5	+10
Female 4	75	80	80	77	+5	-3
Female 5	80	76	86	80	+6	+4
Female 6	70	70	72	75	+2	+5
Female 7	60	65	85	83	+25	+18
Female 8	58	66	68	63	+10	-3
Female 9	92	85	95	90	+3	+5
Female 10	74	72	65	75	-9	+3

Male Data Collection

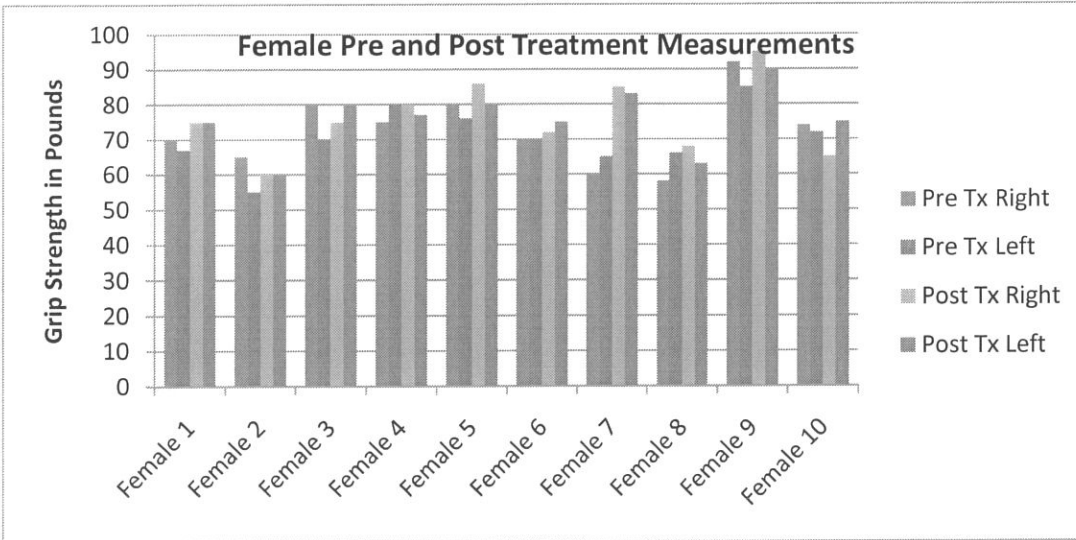
Table 2

	Pre Tx Right	Pre Tx Left	Post Tx Right	Post Tx Left	After Tx Difference Right	After Tx Difference Left
male 1	135	125	150	142	+15	+17
male 2	120	135	123	135	3	0
male 3	86	100	72	100	-14	0
male 4	110	115	115	135	+5	+20
male 5	120	120	115	112	-5	-8
male 6	95	85	93	95	-2	+10
male 7	105	110	115	120	+10	+10
male 8	92	85	90	85	-2	0
male 9	90	100	105	102	+15	+2
male 10	115	120	120	120	+5	0

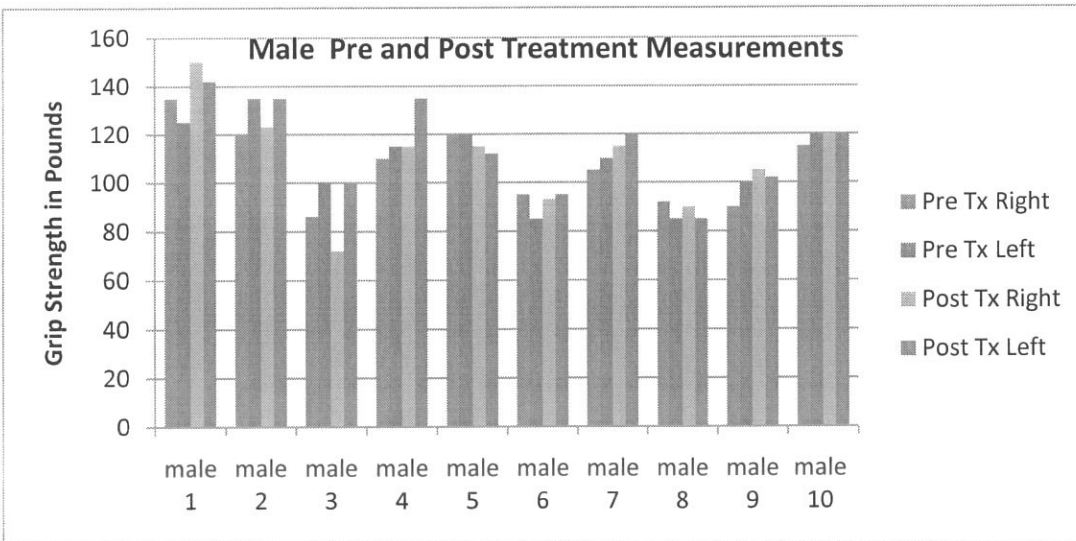
Table 3

Results Average Increase	
Female Right	3.7
Female Left	4.6
Male Right	3.0
Male Left	5.1

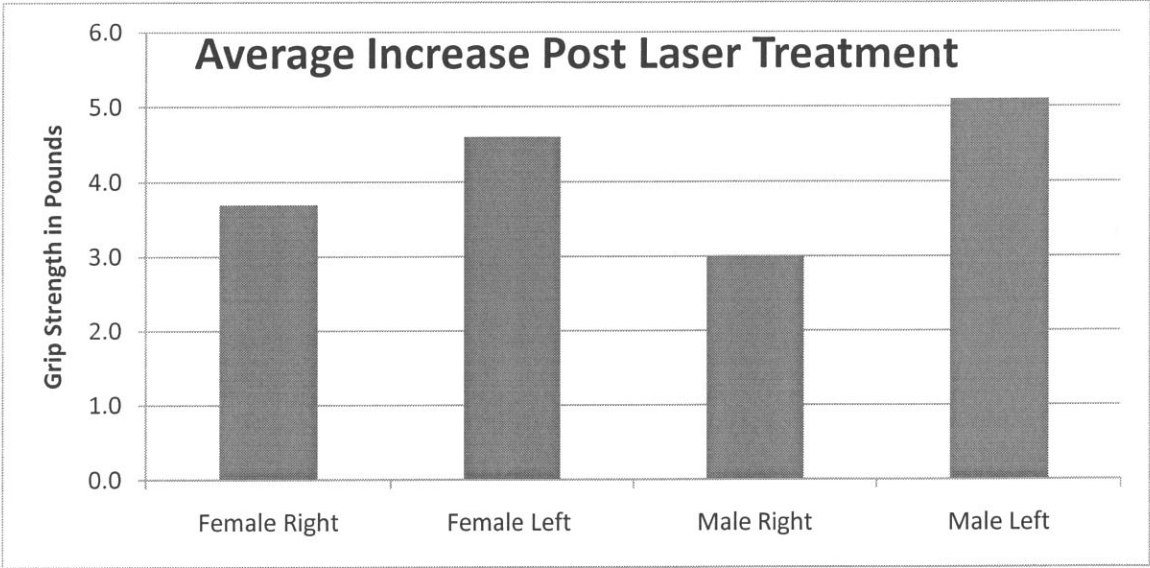
Graph 1



Graph 2

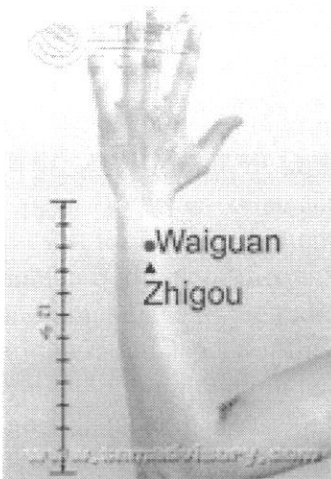


Graph 3



Discussion

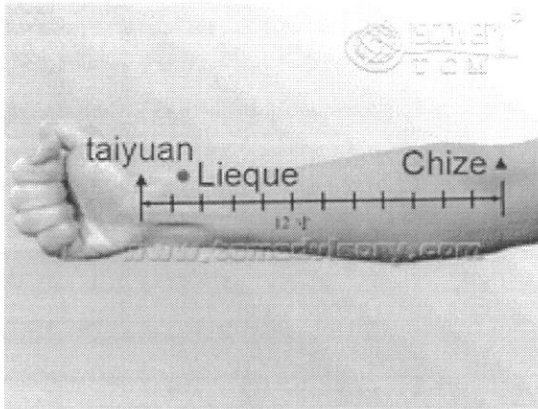
Six acupuncture points around the hand and wrist that correlated with hand problems such as pain, tingling, and decreased range of motion were used according to the *Prescription Index*.⁷ However, since acupuncture points differ from person to person, general points were chosen for this experiment. The points used were: Triple Warmer 5, which is located 2 cun (a human body inch [the width of a thumb]) proximal to the dorsal wrist crease between the radius and ulna, close to the radial bone. Large Intestine 4 located between the 1st and 2nd metacarpals, on the radial aspect of the middle of the 2nd metacarpal bone, at the highest spot of the muscle when the thumb and index fingers are brought together. Lung 7 located 1.5 cun proximal to the most distal skin crease of the wrist, proximal to the styloid of the radius in a depression between the tendons of the brachioradialis and abductor pollicis longus. Heart 9 located on the radial side of the little finger, 0.1 cun proximal to the center of the nail. Small Intestine 6 located with the palm on the chest, at the dorsal and medial head of the ulna, in a depression level with the height of the styloid process. Pericardium 7 located on the anterior forearm in the most distal transverse wrist crease, between the tendons of Palmaris longus and flexor carpi radialis.⁷



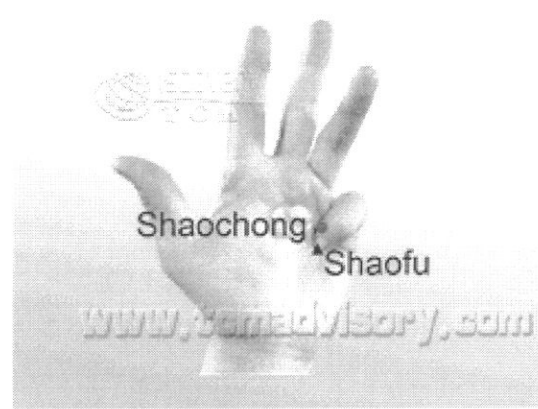
Triple Warmer 5(Waiguan)



Large Intestine 4(Hegu)



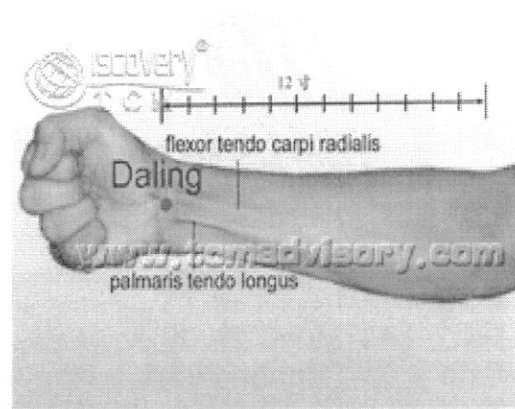
Lung 7(Lieque)



Heart 9(Shaochong)



Small Intestine 6(Yang lao)



Pericardium 7(Daling)

Grip strength was measured before treatment to get a baseline, and then after treatment to see if there was an increase in strength following the treatment using a grip strength dynamometer. The dynamometer is a versatile tool for our study, as it is a reliable way to evaluate grip strength. It is also portable and simple to use and read. Studies for Carpal Tunnel Syndrome have shown the involvement of the muscles on the arm in correlation to CTS.¹⁵ Stimulating these muscles by treating acupuncture points involving these muscles should have effects on the related symptoms.^{15, 16, 18} The participants received laser treatments of 15 seconds per point, for all 6 points, on each hand. The Laser used was a QiPulse laser manufactured by Miridia Technology and is a 5 mW 635 nm wavelength laser.

When studying carpal tunnel patients 30% reported poor to fair strength and long-term scar discomfort, and 57% noted a return of some pre-operative symptoms, most commonly pain, beginning an average of 2 years after surgery.²² Long-term results of carpal tunnel release. According to a study by Naeser on Carpal Tunnel Syndrome, 2/3 of patients treated with the “real” laser treatment were pain and symptom free after completion of treatments.¹⁶ Upon compiling the data, shown in the table, after carrying out the measurements/treatments, there was

a great increase in the number of people who showed an increase in grip strength, with half of the participants showing increased strength in both hands. There was only 1 subject who actually demonstrated a decrease in grip strength bilaterally. There was no real correlation to male versus female and how they responded to treatment.

Conclusion

The acupuncture treatment with the 635nm Qi Pulse Laser did have positive results for both male and female participants. Statistical interpretation of the results was not feasible because of the small sample size, but did provide an area for further research. The mean values of the data showed an increase in the grip strength, however formal interpretation of the data is not possible at this time. For a more consistent and accurate measurement on the Dynamometer patients, should have their arm at 90° of elbow flexion and 90° of shoulder flexion or straight out in front of them on both pre and post measurements. To help assist in keeping the patients arm in the correct position a brace or template could be used during the measurements. There was no report of negative side effects from any of the participants in the study.

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