

Successful Management Of Female Office Workers With "Repetitive Stress Injury" Or "Carpal Tunnel Syndrome" By Low Level Laser Therapy

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 to 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 mW) was used and was directed at the tips of the spinous processes C5 to T1. The laser rapidly alleviated the pain and tingling in the arms, hands and fingers, and diminished tenderness at the involved spinous processes. 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 longterm 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.

Key words

Low level laser; Low power laser; Soft laser, Cervical radicular pain, Repetitive stress injury; Carpal tunnel syndrome

Introduction

Repetitive stress injury (RSI) and carpal tunnel syndrome (CTS) are conditions which are becoming more prevalent in a modern society using desktop computers. They may also be noted in meat packing houses among workers who are meat cutters, auto assemblers, and in musicians who play string instruments. Those afflicted may frequently have pain, numbness, tingling in their hands and wrists and particularly in the thumb, index and middle fingers. It is estimated that these disabilities affect approximately 185,000 U.S. workers a year, at a price of seven billion dollars in lost productivity and medical costs¹. We have encountered a number of symptomatic female office workers in our clinics who have previously been told by physicians that they have CTS or RSI and found that almost all had significant neuromusculoskeletal problems of the head, neck and upper back. Thus, we focused their treatment to the lower cervical and upper thoracic spine, but not the wrists and hands, to determine whether low level laser therapy can be applied in this manner to alleviate the pain.

Methods

Thirty five patients were evaluated who were previously diagnosed as having CTS or RSI due to continued symptoms of pain, numbness and tingling in one or both hands and/or involvement of fingers. They were all females, mean age was 42.1 and ranged from 26 to 61 years. Fifteen patients had symptoms in both hands, 12 in the right hand only and 8 in the left hand only. All patients performed desk jobs such as typing, writing, using computers, answering phones, and clerical work. The average duration of symptoms was 21 months and ranged from less than one month to ten years. They had previously consulted physicians including internists, neurologists, neurosurgeons, as well as acupuncturists, chiropractors, and physical therapists, and had tried standard treatments including analgesics, wrist splints, etc. but without pain relief. All patients were evaluated to determine whether the pain in the hands was grade 1: mild (unpleasant but not incapacitating), grade 2: moderate (about 50% incapacitating) or grade 3: severe (about 100% incapacitating).

Examination of these patients revealed various degrees of abnormal posture with head and neck stooped forward and shoulders that were rounded. Upon palpation, all had tenderness of the tips of

one or more spinous processes in the lower cervical and upper thoracic spine, especially between C5 and T1. In addition, the medial angle of the scapula and the tendinous attachment of the trapezius at the nuchal line were also tender.

Following informed consent, a low level laser diode galliumaluminumarsenide (830 nm) capable of generating up to 100 mW (DioLase™ Model 100, Berkely, California) was used. The laser probe made contact with the skin and was directed perpendicular to the tips of the spinous processes especially between C5 and T1; each tender site was treated for 2 to 5 minutes. Adverse effects were noted if any. After treatment, patients were asked whether the pain in their hands disappeared, was less intense, was more intense or was unchanged.

Patients were followed for a mean of 8.2 months; each averaging 10 treatment sessions during this period. To prevent recurrence of symptoms, attention was directed to the abnormal posture of the head and neck and work ergonomics. Patients were also encouraged to wear a cervical collar and/or a clavicle harness to maintain proper posture. In most patients a strip of threeinch wide surgical tape was applied to the skin vertically from the hairline of the posterior neck down the vertebral spine, and another strip was applied horizontally across the shoulders just below the spines of the scapula. They were also advised of maintaining a proper sitting posture at the workplace while working at their desk or computer. No attention or information was provided to patients relative to working with the wrists or hands.

Results

None of the patients reported any heat in the posterior neck or unpleasant feelings during treatment while the laser unit generated up to 100 mW of power. The pain, numbness and tingling in the hand(s) disappeared or subsided remarkably following low level laser therapy in all patients (figure 1). There were no adverse effects during or following low level laser treatment.

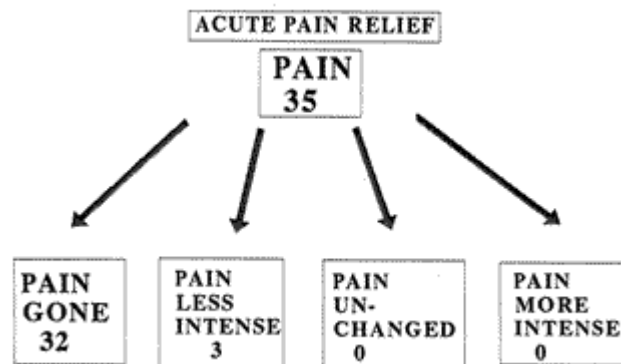


Figure 1.
Immediate amelioration of acute pain after initial treatment.

Before therapy, 13 patients reported grade 3 or severe pain; 20 had grade 2 or moderate pain, and only 2 had grade 1 or mild pain. At a mean of 8.2 month followup, 33 said they had no pain, 1 had moderate and 1 mild pain. Eleven patients had improved 3 grades on the pain scale, 21 improved 2 grades, and 3 improved 1 grade. None of the patients had any deterioration in symptoms (figure 2).

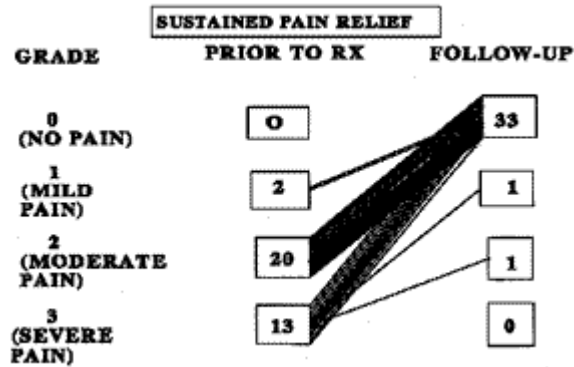


Figure 2.
Quantification of maintained pain relief after 8.2 averaged months of intermittent laser therapy.

Illustrative case studies

Case 1:

Y.C. is a 43 year old secretary who complained of severe pain, tingling and numbness of the arms, hands and fingers. The symptoms had become exacerbated the past 3 to 4 weeks, but had been occurring since an automobile accident three years ago. She works 8 hours per day on a computer as an accountant. She loathes taking any medications. She was told by her neurosurgeon that she may require surgery to alleviate the pain in her hands and arms.

On examination, her head and neck were stooped forward and her shoulders were rounded. The trapezius muscle was very tense. There was marked tenderness in the tips of the cervical and thoracic spinous processes especially in C5 through T3. The Phalen test was positive in less than 5 seconds and the Tinel sign was also positive.

Following informed consent, low level laser 100 mW was directed at the tips of the cervical and thoracic spinous processes for one to two minutes each site and along the nuchal line. At the end of the procedure, the patient immediately felt less pain and tingling in the arms, hands and fingers, and she had less tenderness of the cervical and thoracic spinous processes. The Phalen test was negative.

She was advised to wear a cervical collar and readjust her desktop computer in the workplace. The symptoms in her arms and fingers cleared in less than 2 months; she has noted only some residual fullness in the palmar aspects of the hands.

Case 2:

N.R. is a 47 year old clinical social worker who had pain in both wrists and tingling and numbness in the hands and fingers. Her work involved using a computer, writing on a note pad, and keying in and out of locked wards (approximately 60-80 per day) at a state hospital. The doctors who examined her diagnosed her as having total disability from "carpal tunnel syndrome". She had hydrocortisone injections in her wrists and was told to wear wrist splints, take nonsteroidal antiinflammatory drugs, and apply ice to the wrists.

On examination, her head and neck were stooped forward and shoulders were rounded. The neck and shoulder muscles were very tense. There was marked tenderness and slight edema of the tips of the cervical and thoracic spinous processes.

Low level laser 100 mW was directed at the posterior neck at the tips of the cervical and thoracic spinous processes for three minutes each site. At the end of the procedure, the muscles of the neck and shoulders were much more relaxed. The tips of the spinous processes were no longer tender, and there appeared to be less edema palpated at the lower cervical and upper thoracic spinous processes.

A threeinch vertical tape was placed from the hairline down the vertebral spine to the waist and another horizontal tape was placed just below the spine of the scapula to serve as a reminder for her to maintain the proper posture, and immobilization to aid in the reattachment of the Sharpey's fibers.

The symptoms in her hands and wrists cleared and completely resolved in less than three months. She was reexamined by an independent Workers' Compensation physician and her disability was absent.

Case 3

M.D. is a 33 year old female secretary who presented with headaches, pains in the neck, shoulders, upper arms, forearms, wrists, hands and fingers. She saw a neurologist who diagnosed her as having carpal tunnel syndrome. She was fitted with a wrist splint, and was told if the splint did not relieve her symptoms in the wrists and hands, then surgery would be recommended. Examination revealed edema and tenderness of the spinous processes at the levels of C6,7, T13. In addition, the styloid process, occipital protuberance and origin of the trapezius at the nuchal line and scapula were very tender to palpation.

Following informed consent, low level laser 100 mW was directed to each of the tips of the spinous processes of C5,7, T13 as well as the medial angle of the scapula. The probe was placed on each site for about 1 minute. Following the treatment, a surgical tape from the base of her skull to the lower back, and another tape placed across the shoulder blades were applied. The purpose of taping was to keep the back immobile to hasten the healing of the spinous soft tissue lesions.

The pains subsided during the first visit. On each of three subsequent visits, the patient said she was painfree. As long as she maintained her proper head and upper back posture, the "carpal tunnel syndrome" symptoms did not return.

Discussion

RSI and CTS are thought to occur when muscles and tendons of the fingers, hands and arms are overused. The general result is pain and disability of the hands. The main focus of treatment has been on the hands and wrists, i.e., wearing wrist splints, using better designed keyboards, avoiding straining the fingers, etc. We have observed a group of symptomatic female office workers with the diagnosis of RSI or CTS who have been managed by physicians and other allied health professionals but still had incapacitating symptoms. They usually have accompanied head, neck and shoulder pains due to soft tissue lesions at the nuchal line, tips of cervicothoracic spinous processes, medial angle of the scapula and along the attachment of the trapezius muscle. They have abnormal head and neck posture, and tenderness in the lower cervical and upper thoracic tips of spinous processes. Importantly, in these patients, the focus of treatment was not directed to the wrists or hands but rather to the posterior neck area.

With the use of a low level laser applied onto the tips of spinous processes C5 to T1, we amazingly observed amelioration of the pain and tingling in the arms, hands, and fingers, and relief of tenderness occurred usually immediately after application of low level laser therapy. We have continued to follow these workers for a mean of 8.2 months. All have experienced gradual improvement by using low level laser therapy to reduce pain, correcting the abnormal head, neck

and shoulder posture by educating the patient, taping the neck and shoulders, wearing cervical collars and clavicle harnesses. As a result of successfully managing the posterior neck

and posture in these patients, it is apparent that many office workers with symptoms and diagnoses of RSI or CTS may instead have cervicobrachial syndrome with radicular pain to the upper extremities. True CTS is rarely seen in this group of patients.

To explained these observations, many of these symptomatic patients remembered forgotten injuries in the past as a result of automobile accidents, sports injuries, and falls. It is believed that these injuries produced soft tissue lesions such as tearing of the ligaments, tendons and fascia; these microscopic or macroscopic tears appear to involve Sharpey's fibers and occur at the periostealosseous junctions in the cervical spine. Although a single injury may not be sufficient to produce symptoms, prolonged straining of these areas due to abnormal posture of the head, neck and shoulders from office work may aggravate and perpetuate injuries and result in an inflammatory response, edema formation and the release of chemical mediators that cause pain such as histamine, kinins, proteolytic enzymes and other substances ². These noxious chemicals can directly and by way of withdrawal reflex cause paravertebral muscular contractions, spasms, and ischemia. These substances from injured tissue can also affect nociceptive afferents to the dorsal root ganglion which then sends impulses via neural connections to the anterior horn cells and the motor efferents result in muscular contractions or spasms of muscles distal to the lesion. Muscle contractions and spasms around the lower cervical areas can also result in disc compression, bulging and impingement of the nerve root of the brachial plexus.

Stimulation of the periosteum or the tendinous attachments of ligaments and tendons has been shown to be accompanied by extensive radiation of pain. Inman and Saunders ³ and Feinstein ⁴ have shown that a tiny amount of hypertonic saline injected to interspinous ligaments at various levels of the dorsal spine can cause muscle ischemia, spasm and pain remote from the site of injection. The pain patterns were reproducible and the peripheral nervous system was apparently not involved in the referred pain. Stimulation at C68 levels referred pain to muscles of the brachial plexus. It is conceivable that the low level laser may effect pain relief by modifying and draining these chemicals via lymphatic channels ^{5,6}. Removing the noxious chemicals or the major irritant of muscular tension and spasm result in muscular relaxation of adjacent and distal muscles and can result in less compression on the cervical disc and reduced impingement of the nerve roots.

We have investigated the application of the low level laser in other conditions such as migraine headaches ^{7,8}, chest pain of musculoskeletal origin ⁹, closed lock temporomandibular joint dysfunction ¹⁰, and thus far, the results have been very encouraging. No adverse effects of tissue damage occurred with laser radiation. Thus low level laser treatment at appropriate anatomical areas may offer relief of pain for selected patients with possible cervical radicular pain and those thought to have CTS and RSI due to soft tissue injuries arising from the periostealosseous junctions at the lower cervical and upper thoracic spine. Controlled studies are underway to verify these salutary observations.

REFERENCES

- (1) Horowitz JM, Crippled by Computers, Time Magazine, October 12, 1992. [back](#)
- (2) Guyton, AC. Textbook of Medical Physiology, 8th ea., WB Saunders Co., Philadelphia, 1991. [back](#)
- (3) Inman VT, Saunders JB de CM. Referred pain from skeletal structures.] Nerv and Ment Dis 99

(1944) 660667. [back](#)

(4) Feinstein B, Langton JNK, Jameson RM, Schiller F. Experiments on pain referred from deep somatic tissues. J Bone Joint Surg 36A (1954) 981997. [back](#)

(5) Lee G, Wong E, Mason DT. The application of low power laser therapy and its rationale for relieving pain syndromes. The International Academy of Laser Dentistry Second Annual Meeting Abstracts, October 2931, 1992. [back](#)

(6) Lievens PC. The influence of laser on the lymphatic system. American Society for Laser and Surgery abstracts (1991) 175176. [back](#)

(7) Wong E, Lee G, Chen MZ, Mason DT. Treatment of migraine headaches with the low power laser. Chinese J Laser Med Surg 2 (1993) 135138. [back](#)

(8) Wong E, Tasaki EN, Naskashima NK, Lee G, Cohen H, Mason DT. Efficacy of low power laser therapy in the pain relief of migraine headaches. Ninth Congress of the International Society for Laser Surgery and Medicine Abstracts, November 26, 1991. [back](#)

(9) Lee G, Wong E, Nakashima NK, Tasaki E, Cohen H, Mason DT. Application of low power laser therapy for relief of chest pain of musculoskeletal origin. Lasers Surg Med 4 suppl, (1992) 83. [back](#)

(10) Wong E, Tasaki E, Lee G, Mason DT. Efficacy of low power laser to treat closed lock temporomandibular joint dysfunction. Clin Res 40 (1992) 433A. [back](#)