



# Treatment of Trigger Fingers Associated with Carpal Tunnel Syndrome by Low-Level Laser Therapy and Specific Hand Massage: A Case Report

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## Abstract

Low-Level Laser Therapy (LLLT) has been shown to effect in tissue healing and pain reduction. This case report describes the rehabilitation of a 34 year-old female, left-handed patient who had chronic trigger fingers with bilateral carpal tunnel syndrome (CTS). The patient complained of localized tenderness and deep pain in her index and middle fingers. She suffered night awakening from numbness and tingling in both hands. Clinical examination of passive and active movement elicited pain in the wrist which involved stiff action of finger flexor tendon, associated with hand dysfunction. The Phalen's test was positive. The electrodiagnosis was performed and bilateral CTS of moderate degree was diagnosed. Treatment consisted of LLLT with an energy dose of 2 Joules per tender point and an 18 Joules over the carpal tunnel area with specific hand massage. The hand exercises were prescribed under supervision of physical therapist. The patient received therapy three times per week, for a total of 15 sessions. The degree of numbness was gradually decreased and numeric rating scale decreased from 8/10 to 0/10. The patient reported complete resolution of symptoms that was maintained up to three months of follow-up. This case report emphasizes the importance of LLLT combined with specific hand massage and hand exercise program to promote pain relief in trigger fingers associated with CTS. Further study should be conducted to investigate the combination therapy effects in these patients.

**Keywords:** trigger finger, carpal tunnel syndrome, low-level laser therapy, hand massage, exercise



การรักษาโรคนี้ลือกที่ร่วมกับกลุ่มอาการช่องข้อมือด้วยเลเซอร์ กำลังตัว และการนวดมือแบบเฉพาะเจาะจง: กรณีศึกษารายงานผู้ป่วย

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## บทคัดย่อ

**คำสำคัญ:** นิ้วล็อก, กลุ่มอาการช่องข้อมือ, การรักษาด้วยเลเซอร์กำลังต่ำ, การนวดมือ, ออกกำลังกาย

## Introduction

The hands consist of bones, pulled by tendons which enable the bones to move. They are attached to various muscles. These muscles are connected to the bones at various levels of forearm and elbow by tendons. The tendons are covered by fibrous materials, called tendon sheaths that allow the tendons to glide and slide smoothly when they move across the bones. The wrist contains eight bones, arranged in two rows, called the carpal bones. These bones, when fit together, form a small arch through which all the nerves and tendons pass. The concave anterior surface of the carpal bones and the tendons form a tunnel called “carpal tunnel”. The tendon within the sheath glides easily with normal usage; however, with activities that require frequent repetitive movement, the tendon in the sheath causes too much friction and literally overheats within this very small space. Swelling occurs in this small space, subsequently compresses all the structures within the carpal tunnel. When this condition continues for a while, the median nerve which lies in this tunnel becomes damaged causing numbness in its sensory distribution. In the late stages of this disorder, the patient experiences weakness of thenar muscles. These are the mechanical aspects of *carpal tunnel syndrome (CTS)*<sup>1</sup>.

Early signs of CTS are tingling, “pins and needles” sensation of the hands, followed by a decreased ability to pinch or squeeze objects. During the night, the pain can become so intense that one may be unable to sleep. As the condition progresses, the tingling intensifies and numbness begins. Some patients complain of a swollen sensation despite normal apparent hands. Other late findings are actual muscle loss due to lack of nerve supply to the muscle. The muscle becomes weak and has no strength near the palm<sup>2</sup>.

**Trigger finger** is more common in middle-aged women rather than men. The incidence of trigger digit is 29%<sup>3</sup>. It usually occurs in the index, middle fingers and the thumb. This condition causes painful catching of the involved

flexor tendon as the patient flexes and extends the digit. Trigger finger is also known as stenosing tenosynovitis which occurs when the synovial tunnels become narrower, subsequently impairs the smooth gliding of the tendons through the synovial tunnels. Sometimes the finger becomes stuck or locked that is difficult to straighten or bend<sup>3,4</sup>.

## Case Report

The patient was a 34 year-old, left-handed female who had chronic trigger fingers in both of her hands with bilateral CTS. The patient complained of localized tenderness and deep pain in her index and middle fingers. She suffered night awakening from numbness and tingling in both hands for 2 months. The symptoms start with the discomfort from numbness on the both hands. The pain appeared to be at its worst in the morning and was aggravated by grasping objects or carrying groceries. The movement became more difficult, leading the patient to visit a doctor. After thorough examination and investigation, the doctor informed the patient that it was a case of trigger finger associated with carpal tunnel syndrome. The physical therapist was consulted for proper management.

Clinical examination of passive and active fingers movements of her both hands elicited pain in the wrist which involved stiff action of finger flexor tendons and numbness on the area of median nerve distribution, associated with hand dysfunction (Figure 1). The pain was rated as an 8/10 in intensity on a numeric rating scale (NRS). The palpation revealed no obvious nodules on the flexor tendons. When flexing the fingers she could not perform a forceful grip due to pain and tendon entrapment at the A1 pulley. Orthopedically, Phalen’s test was positive. The electrodiagnosis was performed and revealed bilateral CTS of moderate degree.

## Management

Treatment consisted of Gallium-Aluminium-Arsenide (Ga-Al-As) diode laser device (RJ laser,

Germany) with a wavelength of 810 nm and maximum power output of 500 mW. The laser beam was applied with scanning mode over the median nerve area using landmarks of 5 cm above to below the distal wrist crease and circular scanning on tender points at the base of the index and middle fingers in the palmer surface on her both hands. The laser beam source was set at the

distance of 10 cm away from the skin. (Figure 2). The treatment dose was 2 Joules per each tender point and an 18 Joules over the carpal tunnel area.

Specific hand massage was performed by physical therapist to relieve symptoms. The purposes were to break down the scar tissue and increase circulation to the palm muscles and the fingers (Figure 3). The hand massage technique was

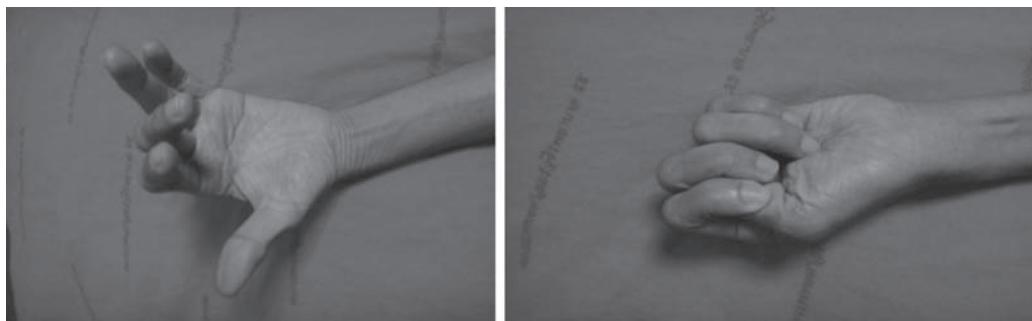


Figure 1: Clinical examination of active movement

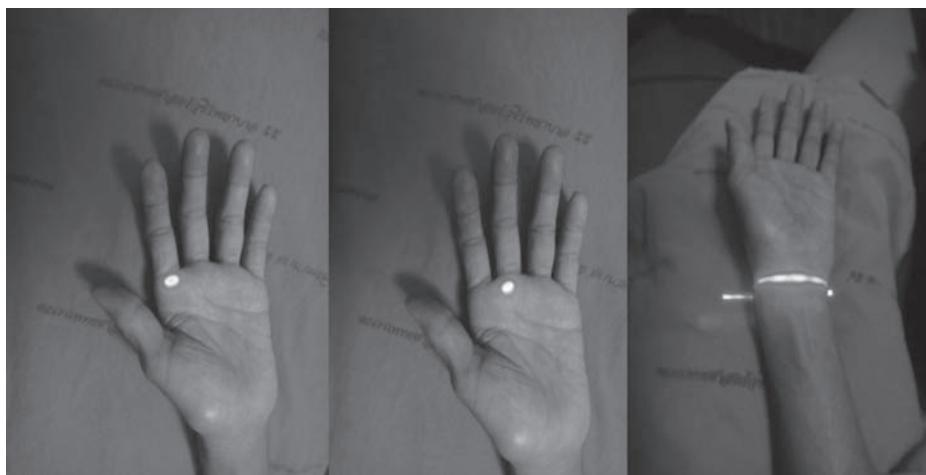


Figure 2: Treatment consisted of LLLT with an energy dose of 2 Joules per each tender point and an 18 Joules over the carpal tunnel area



Figure 3: Specific hand massage

performed by using baby oil or lotion with the scrubbing friction from distal to proximal along the line of the metacarpal bones on the palmer surface 10 times/set for 3 sets (figure 3A). The friction was reported to accelerate the return flow with the pressure in the direction of lymphatic drainage and relieve the edema in the tissues with venous and lymphatic stasis<sup>5,6</sup>.

Scouring depth petrissage massage was also performed by using both thumbs move from carpal tunnel area outside in separate ways above and below the carpal tunnel area starting from distal to proximal direction for 30 times (figure 3B). It has relaxing effect on the palm muscle and sedative effect on median nerve. Petrissage manipulative use improves the circulation and elasticity to preventing atrophy<sup>5,6</sup>. The hand exercise home programs were prescribed under supervision of physical therapist (figure 4).

Starting from forearm supination, stretch the flexor tendons by passively pushing the hand into full wrist extension (figure 4A). Next, stretch the extensor tendons by forearm pronation and passively volar flex the wrist joint to 90 degree (figure 4B). Hold each position for 10 seconds for 10 repetitions. Finger exercises were also prescribed. The patient was told to straighten her fingers into fanning (figure 4C), hook (figure 4D) and tight fist clinches for 10 repetitions (figure 4E).

The patient received therapy three times per week, for a total of 15 sessions. After the first treatment the patient reported the symptom to be better approximately 50% and at the end of the course there was complete resolution of her symptoms. The degree of numbness was decreased gradually and NRS decreased from 8/10 to 0/10 with no pain provocation on examination. The finger dysfunction such as finger lock and poor

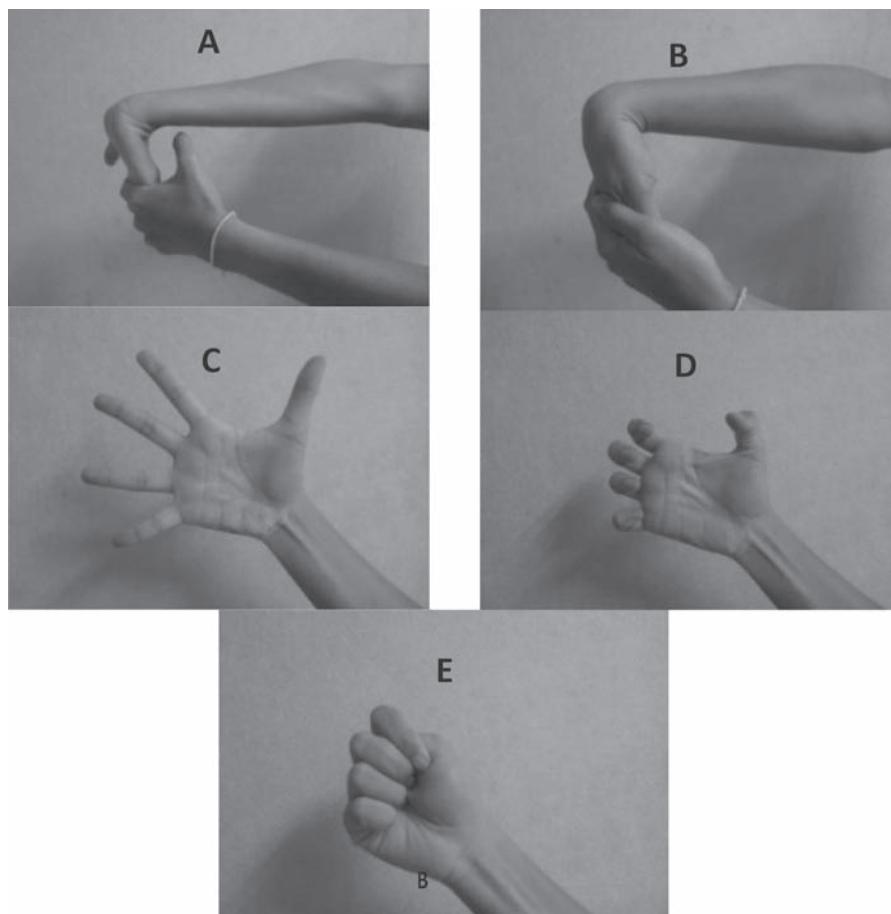


Figure 4: The hand exercise home programs.

hand dexterity was reported to disappear. The improvement was maintained up to three months follow-up.

## Discussion

Trigger finger is a common condition that is usually easy to diagnose and manage. It is characterized by painful clicking and locking of digit. The underlying mechanism is a failure of normal tendon gliding in the A1 pulley region of the tendon sheath. Local injections of steroid appear to provide a short term benefit, but have little long-term benefit and the recurrence rate is high. Considering the known side effects associated with steroids, the usefulness of this treatment is questionable<sup>3,4</sup>.

Low-Level Laser Therapy (LLLT) has been reported to be a non-invasive and effective conservative treatment method. It could accelerate the healing process, elicit anti-inflammatory and tissue-stimulating effects. Significant decrease in pain intensity was observed in various musculoskeletal conditions. The beneficial effects of the LLLT include increasing production of ATP in mitochondria with cellular oxygen consumption, increasing lymphatic drainage, decreasing the inflammation via reduction of prostaglandin synthesis, decreasing edema and improving skin blood supply<sup>7,8,9,10</sup>.

Historically, a preferred treatment for tenosynovitis had been deep friction massages. However, the hand massage plays a role in the reduction of the pain severity by increasing the local sympathetic activity and the level of oxytocin hormone. Furthermore, it has been reported that gate control mechanism is also effective in pain relieving related to massage. Although hand exercises are considered the mainstay of successful treatment and prevention of trigger fingers associated with carpal tunnel syndrome, it does not specifically substantiate the effectiveness to be greater than the previously described conservative treatments<sup>5,6</sup>.

## Conclusion

This case report emphasizes the importance of LLLT combined with specific hand massage and hand exercise program to promote a pain relief in trigger fingers associated with CTS. This treatment programs can decrease pain and numbness while the patient still repeated hand movements for housework during the treatment course. Good practice and early treatment is the key to prevent permanent damage to microstructure of the hands. Various treatments are helpful to relieve inflammation and pain. Good exercises program can prevent recurrent injury. This case could be successfully managed without surgery. To date, there is insufficient evidence to support any single conservative method of treatment due to controversial results on trigger fingers associated with carpal tunnel syndrome. Further study should be conducted to investigate the combination therapeutic effect in these patients.

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