

Research

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Treatment of the Carpal Tunnel Syndrome with Laser

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ABSTRACT

Objective: To test the effectiveness of low intensity laser therapy in patients with carpal tunnel syndrome (CTS).

Methods: Patients with clinical and ENMG diagnosis of CTS never previously treated were included and submitted to clinical evaluation and conduction studies before and after treatment. Sensory and motor conduction studies were performed by conventional described techniques. Low intensity laser treatment was by 660 nm wave length, average power of 30 mw, continuous operation area of 0.06 cm², fluence of irradiation of 10 J/cm², exposure of 10 seconds per point, totalling 6 points of irradiation on the carpal tunnel, from the proximal to the distal sense. Laser was positioned at 90° to the skin, 2 sessions per week during 3 months were performed (24 sessions). To this moment 30 hands of 18 patients were studied.

Results: Clinical data and different parameters on the conduction studies of the median nerve showed improvement after the treatment.

Conclusion: In our opinion low intensity laser therapy is a new, not expensive and easy to apply encouraging treatment for CTS.

KEYWORDS: Carpal tunnel syndrome; Laser; Treatment.

ABBREVIATIONS: CTS: Carpal Tunnel Syndrome; VAS: Visual Analogic Scale; CFA: Carpal Flexion Amplitude; SAPB: Strength of the Abductor Pollicis Brevis.

INTRODUCTION

The Carpal Tunnel Syndrome (CTS) is the most common entrapment neuropathy. After surgery different types of complication may occur,¹⁻¹⁰ then search for new clinical forms of treatment is necessary. The main clinical treatments are physical therapy, bracing, steroid injections and alternative therapies as yoga and acupuncture.¹¹⁻¹³ In recent years, it has taken on increasing importance treatments with ultrasound and laser.¹⁴

The effects of laser on the peripheral nervous system are controversial. Laser application on the distal sensory branch of the radial nerve led to increased latency and decrease velocity.¹⁵ Application on the median nerve in 51 normal volunteers, led to a slight increased latency in sensory antidromic conducting study.¹⁶ Such data were not confirmed by others, whose normal volunteers showed no changes in conduction studies after application of Laser.¹⁷ Some authors described effectiveness of Laser in reversing carpal tunnel syndrome,¹⁸ but this was not confirmed by others.¹⁹ In one meta-analysis, only 2 papers with clinical and conduction studies improvement were found.²⁰ One Brazilian study proposed a randomized controlled trial, which will be useful to assess the effectiveness of the conservative treatment and low-level laser therapy for patients with carpal tunnel syndrome.²¹ The aim of this study was to test the effectiveness of low intensity laser therapy in patients with CTS.

METHODS

After approval by the Ethics Committee on Human Research of our Institution, patients with clinical and ENMG diagnosis of CTS never previously treated were included. Exclusion criteria were diabetes and other endocrine diseases, renal failure, alcoholism or occupational exposure to environmental toxic agents, patients with any other medical conditions that cause polyneuropathy, and antecedents of previous surgery, trauma, burns or fractures in the affected limb. Visual Analogic Scale (VAS), Carpal Flexion Amplitude (CFA) using a goniometer and Strength of the *Abductor Pollicis Brevis* (SAPB) muscle using a dynamometer (Daniels) were determined before and after treatment. Antidromic sensory conduction studies using ring electrodes, and motor conduction studies using standard surface disc electrodes were performed by conventional described techniques²² – Figure 1. Low intensity laser treatment using gallium-indium-phosphorus-aluminium Laser emitter was by 660 nm wave length, average power of 30 nw, continuous operation area of 0.06 cm², fluency of irradiation of 10 J/cm², exposure of 10 seconds per point, totalling 6 points of irradiation on the carpal tunnel, from the proximal to the distal sense. Laser was positioned at 90° to the skin, 2 sessions per week during 3 months were performed (24 sessions) – Figure 2. Statistical analysis from the data obtained before and after treatment was done by the paired “t” test. Correlation between clinical and conduction studies was performed by the Spearman correlation test and Pearson correlation test.

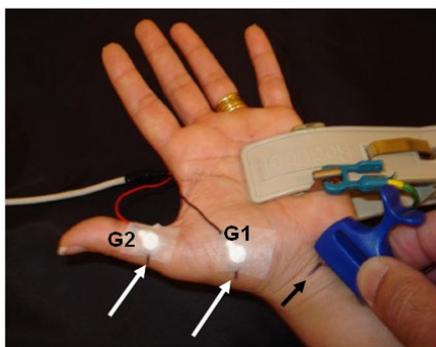


Figure 1: Motor conduction study. The distal motor latency of the median nerve is obtained by stimuli applied with distal cathode (blue, black arrow) and G1 and G2 electrodes positioned according to the belly-tendon technique (white arrows).



Figure 2: Application of the low-level laser on the median nerve across the carpal tunnel.

RESULTS

To this moment 30 hands from 18 patients were analysed (6 with unilateral CTS; 12 with bilateral CTS). From the clinical study, VAS, CFA and SAPB showed improvement after treatment ($p < 0.001$, $p < 0.0028$ and $p < 0.0001$, respectively). VAS values are showed in the Graphic 1. From the conduction studies, distal motor latency and sensory conduction velocity improved after treatment ($p < 0.0003$ and 0.0002 , respectively). Distal motor latency values are showed in the Graphic 2. For the amplitude no significance was observed. In the Spearman correlation test, no statistic significance was observed. In the Pearson correlation test negative correlation between distal motor latency and SAPB was found (for larger values of latency minor values of strength). It was also observed positive correlation between distal motor latency and VAS (for larger values of latency larger values on the visual analogic scale of pain).

DISCUSSION

The analysis of the 30 hands from 18 patients was possible in the last 2 years. For these 30 hands, visual analogic scale, carpal flexion amplitude, strength of the APB muscle, distal motor latency and sensory conduction velocity showed improvement. One study found no statistically significant clinical differences between the group of patients treated with laser and the placebo group, but improved sensory conduction in patients who received Laser was observed, similarly to our data.²³ The Spearman correlation test between clinical data and conduction studies parameters showed no statistic significance. As the Spearman correlation test applies predominantly to ordinal scale variables, and, as in our study the only ordinal scale used was the VAS (visual analogue scale of pain, ranging from zero to ten), we opted for conducting also the Pearson correlation test. The results by this test were logical and predictable, for larger values of distal motor latency, minor values of the strength of the APB muscle and larger values of the VAS were found.

In the last years some encouraging results of Laser for the CTS were described, as subjective improvement,^{24,25} or improvement of the conduction studies and clinical data.^{26,27} In a recent prospective, randomized, placebo-controlled trial Evcik, et al. reported positive effects on hand and pinch grip strengths after low-level laser therapy.²⁸ Beneficial effects of the combination of laser therapy with other methods as night orthopedic splint²⁵ or magnetic stimulation²⁹ were also reported.

CONCLUSION

In our opinion, low intensity laser therapy is emergent as a new, not expensive and easy to apply encouraging treatment for CTS.

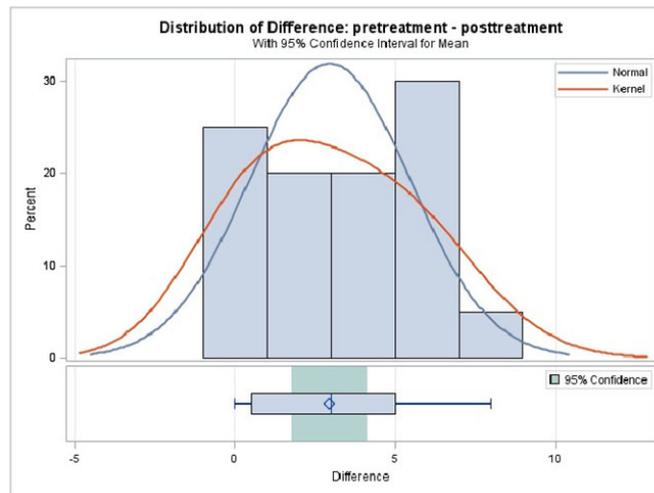
The TTEST Procedure

Difference: pretreatment - posttreatment

N	Mean	Std Dev	Std Err	Minimum	Maximum
20	2.9500	2.5021	0.5595	0	8.0000

Mean	95% CL Mean	Std Dev	95% CL	StdDev
2.9500	1.7790 4.1210	2.5021	1.9028	3.6545

DF	t Value	Pr > t
19	5.27	<.0001



Graphic 1: Paired "t" test for the visual analogic scale (before and after treatment).

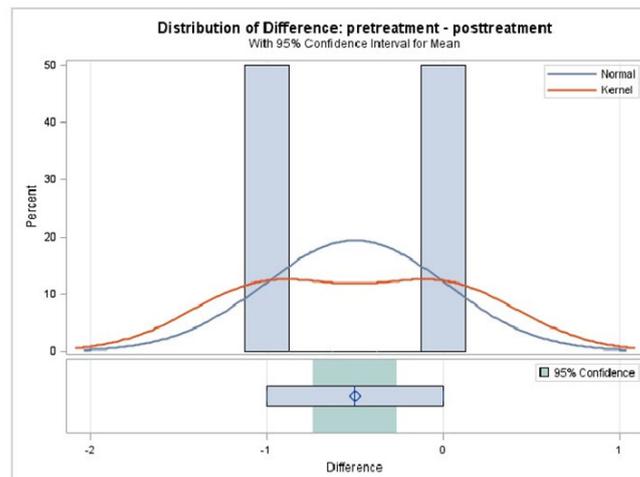
The TTEST Procedure

Difference: pretreatment - posttreatment

N	Mean	Std Dev	Std Err	Minimum	Maximum
20	-0.5000	0.5130	0.1147	-1.0000	0

Mean	95% CL Mean	Std Dev	95% CL	StdDev
-0.5000	-0.7401 -0.2599	0.5130	0.3901	0.7493

DF	t Value	Pr > t
19	-4.36	0.0003



Graphic 2: Paired "t" test for the distal motor latency (before and after treatment).

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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CONSENT STATEMENT

The authors have obtained written informed consent from the patient before submission of this manuscript for publication.

REFERENCES

- Milani P, Mondelli M, Ginanneschi F, Mazzocchio R, Rossi A. Progesterone new therapy in mild carpal tunnel syndrome? Study design of a randomized clinical trial for local therapy. *J Brachial Plex Peripher Nerve Inj.* 2010; 5: 11. doi: [10.1186/1749-7221-5-11](https://doi.org/10.1186/1749-7221-5-11)
- MacDonald RI, Lichtman DM, Hanlon JJ, Wilson JN. Complications of surgical release for carpal tunnel syndrome. *J Hand Surg AM.* 1978; 3(1): 70-76.
- Palmer AK, Toivonen DA. Complications of endoscopic and open carpal tunnel release. *J Hand Surg.* 1999; 24A: 561-565.
- Benson LS, Bare AA, Nagle DJ, Harder VC, Williams CS, Visotsky JL. Complications of endoscopic and open carpal tunnel release. *Arthroscopy.* 2006; 22(9): 919-924. doi: [10.1016/j.arthro.2006.05.008](https://doi.org/10.1016/j.arthro.2006.05.008)
- Malhotra R, Kiran EK, Dua A, Mallinath SG, Bhan S. Endoscopic versus open carpal tunnel release: A short-term comparative study. *Indian J Orthop.* 2007; 41(1): 57-61. doi: [10.4103/0019-5413.30527](https://doi.org/10.4103/0019-5413.30527)
- Boya H, Ozcan O, Oztekin HH. Longterm complications of open carpal tunnel release. *Muscle Nerve.* 2008; 38(5): 1443-1446. doi: [10.1002/mus.21068](https://doi.org/10.1002/mus.21068)
- Li Z, Smith BP, Tuohy C, Smith TL, Andrew Koman L. Complex regional pain syndrome after hand surgery. *Hand Clin.* 2010; 26(2): 281-289.
- Kim NH, Kim DH. Ulnar neuropathy at the wrist in a patient with carpal tunnel syndrome after carpal tunnel release. *Ann Rehabil Med.* 2012; 36: 291-296.
- Lam CH, Yeung SH, Wong TC. Endoscopic carpal tunnel release: experience of surgical outcome in a Chinese population. *Hong Kong Med J.* 2010; 16: 126-131.
- Arnander M, Teoh V, Barabas A, Umarjit S, Fleming A. Improved patient awareness and satisfaction using procedure specific consent forms in carpal tunnel decompression surgery. *Hand Surgery.* 2013; 18(1): 53-57. doi: [10.1142/S021881041350010X](https://doi.org/10.1142/S021881041350010X)
- Cartwright MS, White DL, DeMar S, et al. Median nerve changes following steroid injection for carpal tunnel syndrome. *Muscle Nerve.* 2011; 44(1): 25-29. doi: [10.1002/mus.22067](https://doi.org/10.1002/mus.22067)
- Garfinkel MS, Singhal A, Katz WA, Allan DA, Reshetar R, Schumacher R. Yoga-Baser intervention for carpal tunnel syndrome: a randomized trial. *JAMA.* 1998; 280(18): 1601-1603. doi: [10.1001/jama.280.18.1601](https://doi.org/10.1001/jama.280.18.1601)
- Khoswari S, Moghtaderi A, Haghighat S. Acupuncture in treatment of carpal tunnel syndrome: A randomized controlled trial study. *J Res Med Sci.* 2012; 17(1): 1-7.
- Muller M, Tsui D, Schnur R, Bidulpph-Deisroth L, Hard J. Effectives of hand therapy interventions in primary management of carpal tunnel syndrome: a systematic review. *J Hand Ther.* 2004; 17: 210-228. doi: [10.1197/j.jht.2004.02.009](https://doi.org/10.1197/j.jht.2004.02.009)
- Snyder-Mackler L, Bork C. Effect of helium-neon laser irradiation on peripheral sensory nerve latency. *Phys Ther.* 1988; 68: 223-225.
- Baxter GD, Walsh DM, Allen JM, Lowe AS, Bell AJ. Effects of low intensity infrared laser irradiation upon conduction in the human median nerve in vivo. *Exp Physiol.* 1994; 79: 227-234.
- Greathouse DG, Currier DP, Gilmore RL. Effects of clinical infrared laser on superficial radial nerve conduction. *Phys Ther.* 1985; 65: 1184-1187.
- Weintraub MI. Noninvasive laser neurolysis in carpal tunnel syndrome. *Muscle Nerve.* 1997; 20: 1029: 1031. doi: [10.1002/\(SICI\)1097-4598\(199708\)20:8<1029::AID-MUS14>3.0.CO;2-Q](https://doi.org/10.1002/(SICI)1097-4598(199708)20:8<1029::AID-MUS14>3.0.CO;2-Q)
- Irvine J, Chong SL, Amirjani NS, Chan M. Double-blind randomized controlled trial of low-level laser therapy in carpal tunnel syndrome. *Muscle Nerve.* 2004; 30: 182-187.
- Muller M, Tsui D, Schnur R, Bidulpph-Deisroth L, Hard J. Effectives of hand therapy interventions in primary management of carpal tunnel syndrome: a systematic review. *J Hand Ther.* 2004; 17: 210-228.
- Barbosa RI, Rodrigues EKS, Tamanini G, et al. Effectiveness of low-level laser therapy for patients with carpal tunnel syndrome: design of a randomized single-blinded controlled trial. *BMC Musculoskelet Disord.* 2012; 13: 248. doi: [10.1186/1471-2474-13-248](https://doi.org/10.1186/1471-2474-13-248)

22. Kimura J. Electrodiagnosis in diseases of nerve and muscle. Principles and practice. FA Davis: Philadelphia, 1983.

23. Tascioglu F, Degirmenci NA, Ozkan S, Mehmetoglu O. Low-level laser in treatment of carpal tunnel syndrome: clinical, electrophysiological and ultrasonographical evaluation. *Rheumatol Int.* 2012; 32: 409-415. doi: [10.1007/s00296-010-1652-6](https://doi.org/10.1007/s00296-010-1652-6)

24. Ekim A, Armagan O, Tascioglu F, Oner C, Colak M. Effect of low level laser therapy in rheumatoid arthritis with carpal tunnel syndrome. *Swiss Med Wkly.* 2007; 137: 347-352.

25. Dincer U, Cakar E, Kiralp MZ, Kilac H, Dursun H. The effectiveness of conservative treatments of carpal tunnel syndrome: splint, ultrasound and low-level laser therapies. *Photomed Laser Surg.* 2009; 27(1): 119-125. doi: [10.1089/pho.2008.2211](https://doi.org/10.1089/pho.2008.2211)

26. Yagci I, Elmas O, Akcan E, Ustun I, Gunduz OH, Guven Z. Comparison of splinting and splinting plus low-level laser therapy in idiopathic carpal tunnel syndrome. *Clin Rheumatol.* 2009; 28: 1059-1065. doi: [10.1007/s10067-009-1213-0](https://doi.org/10.1007/s10067-009-1213-0)

27. Casale R, Damiani C, Maestri R, Wells CD. Pain and electrophysiological parameters are improved by combined 830-1064 high-intensity LASER in symptomatic carpal tunnel syndrome versus Transcutaneous Electrical Nerve Stimulation A randomized controlled study. *Eur J Phys Rehabil Med.* 2012; 48: 1-7.

28. Evcik D, Kavuncu V, Cakir T, Subasi V, Yaman M. Laser therapy in the treatment of carpal tunnel syndrome: a randomized controlled Trial. *Photomed Laser Surg.* 2007; 25(1): 34-39. doi: [10.1089/pho.2006.2032](https://doi.org/10.1089/pho.2006.2032)

29. Kuryliszyn-Moskal D, Hojna K, Latosiewicz M. Comparison of the long-term effectiveness of physiotherapy programs with low-level laser and pulsed magnetic field in patients with carpal tunnel syndrome. *Adv Med Sci.* 2011; 56: 270-274. doi: [10.2478/v10039-011-0041-z](https://doi.org/10.2478/v10039-011-0041-z)