

Efficacy of Manual Therapy Including Neurodynamic Techniques for the Treatment of Carpal Tunnel Syndrome: A Randomized Controlled Trial

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ABSTRACT

Objective: The purpose of this randomized trial was to compare the efficacy of manual therapy, including the use of neurodynamic techniques, with electrophysical modalities on patients with mild and moderate carpal tunnel syndrome (CTS).

Methods: The study included 140 CTS patients who were randomly assigned to the manual therapy (MT) group, which included the use of neurodynamic techniques, functional massage, and carpal bone mobilizations techniques, or to the electrophysical modalities (EM) group, which included laser and ultrasound therapy. Nerve conduction, pain severity, symptom severity, and functional status measured by the Boston Carpal Tunnel Questionnaire were assessed before and after treatment. Therapy was conducted twice weekly and both groups received 20 therapy sessions.

Results: A baseline assessment revealed group differences in sensory conduction of the median nerve ($P < .01$) but not in motor conduction ($P = .82$). Four weeks after the last treatment procedure, nerve conduction was examined again. In the MT group, median nerve sensory conduction velocity increased by 34% and motor conduction velocity by 6% (in both cases, $P < .01$). There was no change in median nerve sensory and motor conduction velocities in the EM. Distal motor latency was decreased ($P < .01$) in both groups. A baseline assessment revealed no group differences in pain severity, symptom severity, or functional status. Immediately after therapy, analysis of variance revealed group differences in pain severity ($P < .01$), with a reduction in pain in both groups (MT: 290%, $P < .01$; EM: 47%, $P < .01$). There were group differences in symptom severity ($P < .01$) and function ($P < .01$) on the Boston Carpal Tunnel Questionnaire. Both groups had an improvement in functional status (MT: 47%, $P < .01$; EM: 9%, $P < .01$) and a reduction in subjective CTS symptoms (MT: 67%, $P < .01$; EM: 15%, $P < .01$).

Conclusion: Both therapies had a positive effect on nerve conduction, pain reduction, functional status, and subjective symptoms in individuals with CTS. However, the results regarding pain reduction, subjective symptoms, and functional status were better in the MT group. (*J Manipulative Physiol Ther* 2017;40:263-272)

Key Indexing Terms: *Carpal Tunnel Syndrome; Manual Therapy; Physical Therapy*

INTRODUCTION

Carpal tunnel syndrome (CTS) is the most common and most commonly described neuropathy of the peripheral nervous system.^{1,2} The reported incidence varies from 1.5% to 3.8%.³⁻⁵ Carpal tunnel syndrome often affects

persons of working age and may lead to absences from work and a marked decline in performance.⁴ High prevalence and the major socioeconomic impact of CTS are reasons to search for effective, inexpensive treatments.⁶

Both conservative and surgical approaches to treating CTS are used. Conservative medical procedures include splinting the wrist at night, oral pharmacotherapy, and local steroid injections.⁷ Physical therapy for CTS usually involves electrophysical modalities or manual therapy, including the use of neurodynamic techniques.⁶⁻⁸ Alternative treatments, such as yoga, acupuncture, massage, and traditional cupping therapy have also been investigated.⁹⁻¹²

The choice of treatment method—both the type and temporal sequence of therapy—is very controversial. Most studies have reported better results for surgical treatment of CTS compared with conservative treatment.^{8,13,14} There is a wide range of conflicting opinions regarding the efficacy

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of pharmacologic treatment.^{15,16} The efficacy of physical therapy has also been questioned.¹⁷⁻²¹ There is some conflicting information about the efficacy of neurodynamic techniques^{18,20} and electrophysical modalities^{21,22} in the nonsurgical treatment of CTS.

Current CTS treatment protocols may include surgical treatment as well as conservative treatments such as physical therapy. However, to our knowledge, evidence regarding the efficacy of physical therapy is lacking.^{23,24} As a result, physical therapy is often ignored in reviews of treatments for CTS.²³ Therefore, it is necessary to establish the efficacy of the various types of physical therapy in order to find optimal therapeutic regimens for use by physical therapists in clinical practice and to reject the use of ineffective techniques.

Low-level laser and ultrasound therapies are often used in the treatment of CTS.²⁵⁻²⁷ The mechanism of ultrasound therapy includes thermal and nonthermal effects, which results in pain relief and anti-inflammatory and tissue-stimulating effects.²⁸ There are some conflicting results on the efficacy of therapeutic ultrasound in the treatment of CTS.^{17,26} Several clinical trials have revealed that therapy using ultrasound has positive effects,^{26,29} but some reports also have indicated that ultrasound therapy is as effective as placebo.^{17,30} In turn, low-level laser therapy has been reported to be effective in increasing mitochondrial ATP production, cellular oxygen consumption, and serotonin and endorphin levels, which lead to pain relief and anti-inflammatory reactions.^{27,31} There are also some controversial results regarding the use of low-level lasers in the treatment of CTS.^{19,22,25,32} Shooshtari et al³² and Yagci et al²⁵ reported positive effects, whereas Irvine et al¹⁹ and Evcik et al²² reported that low-level laser therapy was no more effective than placebo in CTS treatment. Bakhtiary and Rashidy-Pour²⁷ compared the efficacy of ultrasound and laser modalities for mild and moderate idiopathic CTS. They reported that ultrasound treatment was more effective than laser therapy in CTS treatment. In contrast to the Bakhtiary and Rashidy-Pour work, in this paper we decided to combine laser and ultrasound modalities, looking for a possible cumulative effect on CTS treatment. As a result, this is the first study to combine these 2 modalities.

In the physical therapy profession, manual therapy is defined as a clinical approach, including diagnosis and treatment, directed at joint structures and soft tissues. The most notable forms of manual therapy are joint manipulation, joint and soft tissue mobilization, and massage.^{33,34}

Neurodynamic techniques are a relatively new development in physical therapy, and they are mostly treated as a part of manual therapy.^{33,34} To date, the assessment of efficacy of manual therapy treatments in CTS has produced conflicting results.³⁵ However, their potential value as part of CTS therapy should be studied more extensively in randomized trials. Hence, this is the first study to evaluate the efficacy of manual therapy (functional massage and

carpal bone mobilization) including the use of neurodynamic techniques conducted by a physiotherapist in CTS treatment.

The purpose of this study was to evaluate manual therapy including the use of neurodynamic techniques (MT group) compared with electrophysical (laser and ultrasound) modalities (EM group) in the treatment of CTS. We hypothesized that the use of manual therapy including the use of neurodynamic techniques would be more effective in the treatment of CTS than low-level laser and ultrasound modalities.

METHODS

Ethics

The study was authorized by the Bioethics Committee for Scientific Studies at the Physical Education College of Katowice on May 31, 2007 (Decision No. 16/2007). All study procedures were performed according to the Helsinki Declaration of Human Rights of 1975 (modified in 1983). The clinical trial registration number is ACTRN12614000367640.

Study Design

This was a multicenter, randomized, controlled, single-blinded, parallel-group design study. The study took place in 2 medical clinics in the Silesia province in Poland from 2007 to 2012. Participants were randomly allocated to the MT group or the EM group. The MT group received 20 treatments of manual therapy including the use of neurodynamic techniques. The EM group received 20 treatments of laser and ultrasound. Therapy was conducted twice weekly for 10 weeks. All patients were informed about what the study would involve and told that they could withdraw at any stage without giving a reason. Written informed consent was obtained from all participants.

Participants

Participants with CTS diagnosed by a physician were enrolled in the study. The selection process did not specify the age of the participants (all were older than 18 years of age). Recruitment was performed in 2 medical clinics in the Silesia province in Poland.

The necessary sample size was assessed based on preliminary results from 20 participants. Calculation of sample size was based on an α of 0.05 and a statistical power of 0.80. Based on this calculation, we aimed to recruit 77 patients for each treatment group.

Protocols

Diagnostic Criteria for CTS. In all cases, CTS was diagnosed by a physician. From all patients who had diagnosed CTS, the main inclusion criterion was the presence of 2 or more

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