THE EFFECTS OF ACTIVE RELEASE TECHNIQUE ON CARPAL TUNNEL PATIENTS: A PILOT STUDY

JAMES W. GEORGE, DC[a], RODGER TEPE, PHD[a], DAMIEN BUSOLD, DC[b], SARAH KEUSS, DC[c], HEIDI PRATHER, DO[d], CLAYTON D. SKAGGS, DC[a]

[a]*Division of Research, Logan College of Chiropractic, St. Louis, MO.* [b]*Practice of chiropractic, St. Louis, MO.* [c]*Practice of chiropractic, Chicago, IL.* [d]*Department of Orthopedics, Washington University School of Medicine, St. Louis, MO.*
Submit requests for reprints to: Dr. James George, 1099 Milwaukee Street Suite 230, St. Louis, MO 63122.
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ABSTRACT

Objective: To examine changes in electromyography (EMG) and a valid self-administered outcome measure after applying active release technique to carpal tunnel syndrome (CTS) patients.

Methods: Five subjects (mean age 48.2 SD ± 16.7) with CTS were included in the trial. Subjects completed the Boston Questionnaire (BQ) and an EMG examination before the first treatment. Participants were treated with Active Release technique using a protocol intended to affect the median nerve 3 times a week for 2 weeks. The BQ was re-administered following the final treatment. The mean scores for the initial and final BQ were compared using a paired samples t-test. An analysis of variance compared the mean contraction amplitudes for EMG parameters before and after the first treatment.

Results: There was significant improvement (p < 0.05) in the mean symptom severity and functional status scores of the BQ following the intervention. There were no significant differences found in the EMG analyses.

Conclusion: The preliminary data from this clinical pilot trial suggest that active release technique may be an effective conservative management strategy for CTS patients. These results support the need for further clinical trials with larger samples. (J Chiropr Med 2006;5:119–122)

Key Indexing Terms: Musculoskeletal Manipulations; Carpal Tunnel Syndrome

INTRODUCTION

Carpal tunnel syndrome (CTS) is the most common nerve entrapment disorder affecting 1–3% of the general population.[1] It has been estimated that direct medical costs associated with CTS in the United States exceed $1 billion a year, with associated costs approaching $13 billion a year.[2,3] Carpal tunnel release is now the most common hand surgery with more than 200,000 procedures performed annually.[4] In the Netherlands, 39% of neurologists prefer surgery over conservative care for the initial treatment of CTS.[5] In the United States conservative management is still the preferred treatment of mild to moderate cases of CTS and is often used to prevent surgery or provide symptom relief for those awaiting a surgical procedure.[6,7] The most common non-surgical treatments for CTS include wrist splints, exercise, NSAIDs, injections, ultrasound, yoga, manipulation, acupuncture and myofascial release.[7–9] The evidence for conservative measures does not support a specific intervention for CTS.

A recent systematic review on conservative interventions recommended wrist splinting for patients with mild to moderate CTS, while another found that only steroid injections were supported by the literature.[10] A Cochrane database review on non-surgical versus surgical treatments for CTS concluded surgery was the better approach, however, wrist splinting was the only non-surgical treatment included in the review.[11] Napadow et al[12] had 6 CTS patients undergo 5 weeks of acupuncture and evaluated changes in functional MRI, nerve conduction and Boston Questionnaire (BQ) scores. The patients experienced improvements in subjective and objective measures following the acupuncture intervention.[12] Improvements in BQ scores were seen at 2 weeks (p < .05) and at 5 weeks (p < .001) following acupuncture treatment.

Myofascial therapies, including active release technique (ART), are anecdotally reported as effective for treating CTS, but there is little strong evidence to support such claims. A recent review of conserva-

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tive interventions for CTS by Michovitz[7] excluded myofascial therapies. Goodyear-Smith and Arroll's[6] systematic review on non-surgical approaches, while not addressing myofascial therapy, concluded there was no good evidence supporting chiropractic treatment for CTS. Studies involving chiropractic interventions in CTS have included osseous manipulation and myofascial releases.[9,13]

Most evidence on ART is anecdotal and based on case reports.[14,15] One preliminary study on ART reported a 71% efficacy rate in treating overuse syndromes such as CTS.[16] A report by Leahy[8] stated that three treatments with ART typically result in 50% improvement and that of 223 patients diagnosed with CTS and related syndromes, 96.4% returned to work with little to no pain and did not require further treatment. Although generally positive, these studies lack rigor (eg, no mention of randomization, control and inferential statistics). One underreported measure in ART literature is electromyography (EMG). In a recent study, Drover et al[17] treated the quadriceps in participants with anterior knee pain using ART. Utilizing a Newton meter conversion of torque, pre-post EMGs found no significant difference in knee extensor strength.[17]

This pilot study was designed to assess any impact of ART on symptom severity and functional status in CTS patients using the BQ as the outcome measure. A secondary objective was to determine if there was a significant difference in muscle contraction amplitudes following the initial active release treatment as measured by surface EMG.

METHODS

The institutional review board of Logan College of Chiropractic approved this study. Participants were recruited from the Logan College Montgomery Health Center. Five participants (4 female, 1 male) with physician-diagnosed CTS were recruited for this investigation (mean age 48.2, SD ± 16.7). The average symptom duration was 2.3 years. No participant reported involvement in a workers' compensation case. The inclusion criteria included: 1) physician diagnosed CTS; 2) age greater than 18 years; and 3) ability to read and understand the study instructions and written consent form. Exclusion criteria were: 1) prior treatment with wrist splint or carpal tunnel release surgery; 2) history of median nerve injury from trauma; 3) current pregnancy; 4) history of diabetes mellitus; 5) clinical signs of cervical radiculopathy; or 6) severe thenar muscle atrophy.[10] After inclusion and exclusion criteria were met, each participant received an explanation of the study and signed a written consent form prior to their participation.

On their first visit, participants completed the self-administered Boston Questionnaire. The BQ was developed by Levine et al[18] specifically to evaluate CTS. This self-administered questionnaire has shown good reliability and validity in measuring both symptom severity (SS) and functional status (FS), as well as differentiating CTS from other hand injuries.[19] The authors consulted with hand surgeons, rheumatologists and patients to develop the BQ. Levine et al[18] calculated 0.91 and 0.93 Pearson correlation coefficients for the SS and FS scales, respectively. They also reported high internal consistency with Cronbach alphas of 0.89 (SS) and 0.91 (FS). Greenslade et al[20] reported reliability coefficients of 0.82 (SS) and 0.79 (FS). The BQ is also practical for patients with a mean time to complete the questionnaire of 5.6 minutes SD ± 3.5.[20] Sensitive to clinical change, the BQ is considered to be the standard outcome measure in clinical investigations involving CTS patients.[12,18,21]

The SS scale is comprised of 11 questions and each multiple choice question is scored from 1 (mild) to 5 (severe). The SS score is the mean of the 11 responses. The FS scale contains 8 activities with responses ranging from 1 (no difficulty with the activity) to 5 (cannot perform the activity at all). The FS score is the mean of the 8 responses.

Following completion of the BQ, the EMG examination was performed. The EMG data were collected and analyzed by an investigator who was masked to participant status. Surface pads were placed at the flexor carpi radialis (FCR) and extensor digitorum (ED). The pads for the FCR were positioned one-half inch apart at the midpoint on a line from the lateral aspect of the biceps tendon at the elbow crease to the pisiform bone. The ED pads were one-half inch apart and centered at the first quarter point on a line from the lateral epicondyle to the styloid process of the ulna. Participants were seated with arm relaxed and wrist secured firmly to the testing chair. If symptoms were bilateral the more symptomatic arm was used. Two maximum isometric contractions of wrist flexion (MIC-F) and wrist extension (MIC-E) were performed for normalization followed by three repetitions of active wrist flexion (AF) and extension (AE). EMG signals were amplified (±2.5 V), recorded and A/D converted at a 12-bit resolution with a 1024 Hz sampling rate. The EMG data were recorded immediately prior to and immediately following the first treatment session. The surface EMG pads remained in place for both measurements.

After completion of the initial BQ and EMG measures, participants began the treatment period. Participants were seen 3 times a week for 2 weeks. Each participant was treated by the same investigator who was masked to the BQ and EMG results. The treatment protocol included active release treatments to the median nerve at the thenar muscles, carpal tunnel, flexor digitorum superficialis, pronator teres, and ligament of struthers. Each site was treated with 3 passes of active release therapy. The ART treatment pass involved taking tissue to a shortened position, applying a manual contact, and then actively lengthening the tissue while maintaining the contact.

The BQ was repeated immediately following the final treatment. The mean scores for the initial and final SS and FS were calculated and compared using one tailed paired samples t-tests. A repeated measures analysis of variance (ANOVA) was used to compare the pre and post mean contraction amplitudes of the FCR and ED. The a priori alpha level was set at $p < 0.05$.

RESULTS

One tailed paired t tests of the BQ SS and FS scales showed significant decreases ($p < 0.05$) in the post treatment scores (Table 1). Both SS and FS scores were reduced in all participants. No significant differences were found in the EMG analyses of FCR or ED amplitudes after the ART treatment for AF ($p = 0.81$) or AE ($p = 0.09$).

TABLE 1
VALUES FOR SYMPTOM SEVERITY (SS) AND FUNCTIONAL STATUS (FS) FROM THE BOSTON QUESTIONNAIRE BEFORE AND AFTER THE 2-WEEK ACTIVE RELEASE TREATMENT PERIOD

	MEAN-PRE (SD)	MEAN-POST (SD)	P
SS (N = 5)	2.87 (1.03)	1.73 (0.16)	0.03*
FS (N = 5)	2.63 (0.89)	1.48 (0.32)	0.02*

* DENOTES SIGNIFICANCE P < 0.05.

DISCUSSION

The purpose of this pilot clinical trial was to assess for potential treatment effects of active release technique on SS and FS in a small group of CTS patients and to determine if there were significant changes in EMG amplitudes following an ART treatment. Our population of CTS participants showed significant improvements in both SS and FS following the two-week treatment intervention. This improvement in the BQ scores is clinically relevant because of the questionnaire's responsiveness to clinical change. This indicates that these patients likely experienced clinically meaningful improvements in their symptom level and ability to perform the functions contained in the BQ. The EMG analyses showed no significant changes in FCR or ED contraction amplitudes following the single active release treatment. One of the possible explanations for the lack of significant change in the EMG examination was the single treatment measurement. Due to the variability seen when replacing surface EMG electrodes we chose not to attempt EMG analyses on subsequent treatments. We anticipate that if EMG analyses were conducted with needle EMG, reliability could be maintained. Using this in a more comprehensive study could determine if several active release treatments significantly change muscle activation levels.

There were several limitations to this study. The number of participants utilized was small and their response to treatment may not be representative of the general population; however, our male to female ratio was similar to that of a previously published report.[22] The lack of a control does not permit us to conclude that our results would have been significantly different from time alone or placebo. Additionally, we were unable to directly compare our results with those of prior investigations as previous studies used various methodological designs, therapeutic procedures and outcome assessments. Finally, without a follow-up encounter we were unable to determine if the improvements in SS or FS were maintained following the 2-week treatment period.

Prior investigations have examined the impact of ART on CTS. Schiottz-Christensen et al's[16] uncontrolled study used active release protocols based on participant selected pain drawings over a 4-week treatment period. Of the 28 participants, 8 were diagnosed with CTS and 3 of those reported being worse, per the pain-drawing, after the 4-week treatment period. There were significant improvements in several questions scored on the pain questionnaire; however, they did not distinguish CTS patients' scores and presented no reliability or validity data on their questionnaire. Davis et al[13] published a randomized clinical trial that demonstrated significant improvements in CTS symptoms for patients in both conservative medical and chiropractic groups. Although the chiropractic group utilized myofascial massage, it also included high-velocity, low amplitude thrusts (wrist, elbow, shoulder, cervical spine, thoracic spine), ultrasound and nocturnal wrist supports. The authors were unable to assess the active component within their intervention.

The results of our EMG analyses were similar to that of previous investigators. A recent study by Drover and colleagues[17] used EMG following a single treatment with active release technique to measure quadriceps torque production. Measurements were taken pre-treatment, post-treatment and 20 minutes post-treatment. As with our data, no significant difference was found in the EMG analyses following the single treatment. The authors concluded that multiple sessions of active release may be needed before a significant change in EMG is produced.

ART provided significant improvements in symptom severity and functional status in our small sample of CTS patients. It did not demonstrate an ability to significantly change muscle contraction forces in the FCR or ED following a single treatment session. Further studies using larger samples are necessary to determine if ART is an appropriate non-surgical approach for this population of patients. Additionally, further EMG analyses of ART following several treatment sessions are needed.

CONCLUSIONS

The preliminary data from this small clinical pilot suggest that ART may be an effective conservative management strategy for CTS patients. The EMG analyses suggest that ART does not significantly affect the contraction amplitudes of the flexor carpi radialis or extensor digitorum following a single treatment session using the median nerve protocol. These results support the need for more quality clinical research in this area.

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