Electroacupuncture and wrist splinting for carpal tunnel syndrome: a randomised trial

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KEY MESSAGES

1. In patients with chronic (≥6 months) primary carpal tunnel syndrome (CTS) but no surgical indications, electroacupuncture plus night splinting is more effective than night splinting alone in reducing symptoms and improving function, dexterity, and pinch strength. Nonetheless, the magnitude of improvement in sensation and pain was modest.
2. Electroacupuncture is a useful addition to night splinting for patients with primary CTS, particularly those with chronic mild to moderate symptoms.

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Introduction

Primary carpal tunnel syndrome (CTS) is a common peripheral entrapment neuropathy with an estimated prevalence of 2.7%. It is a major cause of disability and incurs considerable limitation in daily activities. As a work-related disorder, CTS has a significant economic impact and often leads to compensation claims. For the management of mild and moderate CTS without median nerve denervation, conservative treatment of night wrist splinting and local steroid injection into the carpal tunnel is commonly used prior to carpal tunnel release surgery. Splinting is often used as first-line treatment. Nonetheless, according to the Cochrane review, splinting only improves CTS symptom score slightly at 4 weeks, whereas steroid injection is superior to placebo injection in improving symptoms at 4 weeks although longer term effect beyond 12 weeks is uncertain. Only one-third of CTS patients who receive steroid injection achieve longer term benefits, and some require two to three further injections to achieve relief. Patients who receive repetitive steroid injections are more likely to develop postoperative CTS symptoms, if they eventually opt for surgery.

Electroacupuncture is a common technique for managing pain and neuropathy. Current clinical evidence of its effectiveness is conflicting and does not clarify its value on top of splinting in a primary care setting. We conducted a randomised trial to compare electroacupuncture plus night splinting with night splinting alone for CTS.

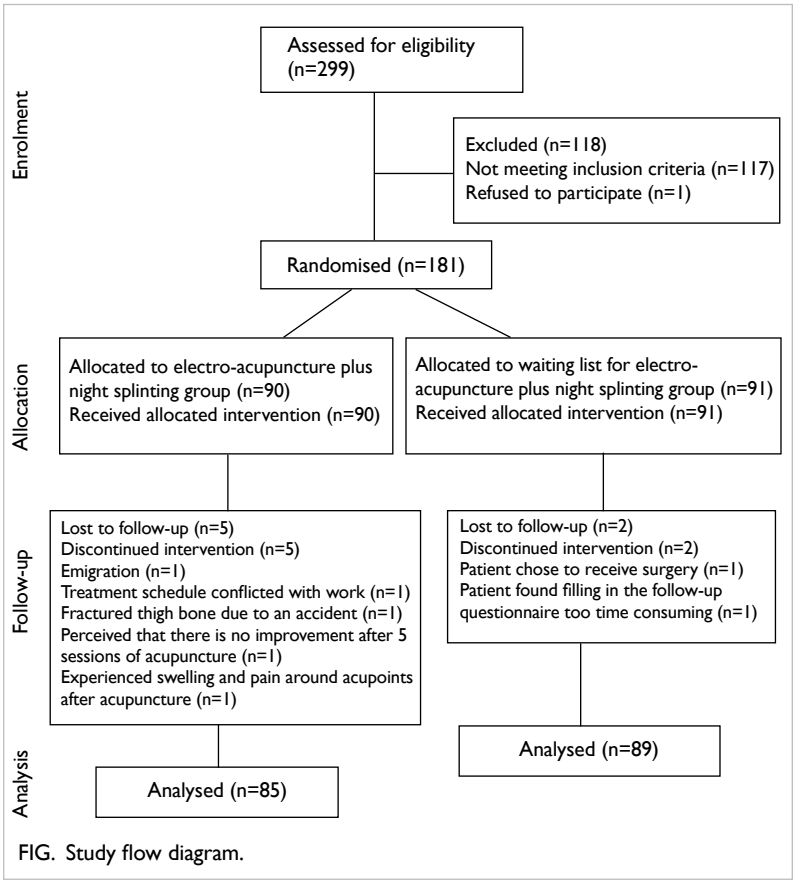

FIG. Study flow diagram.

Methods

This study was a prospective, randomised, parallel group trial that compared those with 13 sessions of electroacupuncture plus night splinting with those on the waiting list plus night splinting for idiopathic primary CTS. The duration of the trial was 17 weeks. As recommended by the American Academy of

Orthopaedic Surgeons, the Boston Carpal Tunnel Questionnaire and the Disabilities of the Arm, Shoulder, and Hand (DASH) Questionnaire were used as CTS specific and regional primary outcome measures, respectively. The Boston Carpal Tunnel Questionnaire has two subscales: the Symptom Severity Scale and the Functional Status Scale, with a summary score of 0 to 5; higher score indicates greater severity. The DASH questionnaire includes physical, social, and psychological function domains, with a summary score of 0 (no disability) to 100 (maximum disability).

Pain intensity, strength, sensation, and dexterity were evaluated as secondary outcomes. For pain intensity, a 0 to 10 point numerical rating scale was used. For sensation, the Semmes-Weinstein monofilament test was used. For dexterity, both blinded and unblinded versions of the Dellon-modified Moberg pick-up test (DMMPUT) were conducted. For strength, maximal tip pinch strength was measured by a hydraulic gauge pinch dynamometer (B&L Engineering PG-30 Pinch Gauge). For the latter two tests, three measurements were made per test and the average was taken as the final value. Adverse events related to electroacupuncture and splinting were monitored.

TABLE 1. Improvement in outcome from baseline

Outcome	Mean (95% CI)		Mean difference (95% CI) in score change	P values (linear model adjusted for baseline values)
	Electroacupuncture plus night splinting group	Waiting list plus night splinting group		
Boston Carpal Tunnel Questionnaire				
Symptom Severity Scale				
1st week	0.04 (-0.03, 0.12)	0.01 (-0.08, 0.10)	0.02 (-0.09, 0.13)	0.75
2nd week	-0.01 (-0.09, 0.07)	-0.02 (-0.13, 0.08)	-0.01 (-0.13, 0.11)	0.88
5th week	-0.17 (-0.28, -0.06)	-0.06 (-0.19, 0.07)	-0.15 (-0.29, -0.01)	0.04
17th week	-0.25 (-0.37, -0.12)	-0.09 (-0.25, 0.06)	-0.20 (-0.36, -0.03)	0.02
Functional Status Scale				
1st week	0.14 (0.05, 0.23)	0.09 (0.00, 0.18)	0.05 (-0.08, 0.17)	0.47
2nd week	0.11 (0.00, 0.22)	0.07 (-0.04, 0.17)	0.03 (-0.12, 0.17)	0.71
5th week	-0.01 (-0.12, 0.11)	0.06 (-0.07, 0.18)	-0.09 (-0.24, 0.06)	0.25
17th week	-0.16 (-0.28, -0.04)	0.02 (-0.13, 0.17)	-0.22 (-0.38, -0.05)	0.01
Disabilities of the Arm, Shoulder, and Hand Questionnaire				
1st week	0.09 (-1.65, 1.82)	0.36 (-1.76, 2.48)	-0.44 (-3.09, 2.21)	0.75
2nd week	-1.45 (-3.48, 0.58)	-0.54 (-3.02, 1.94)	-1.11 (-4.19, 1.97)	0.48
5th week	-4.02 (-6.48, -1.56)	-0.87 (-3.92, 2.19)	-3.50 (-7.16, 0.16)	0.06
17th week	-7.75 (-10.55, -4.95)	-1.53 (-5.15, 2.09)	-6.72 (-10.9, -2.57)	<0.01
Numerical rating scale on pain intensity				
1st week	-0.22 (-0.68, 0.23)	-0.43 (-0.89, 0.04)	-0.14 (-0.40, 0.68)	0.61
2nd week	-0.30 (-0.81, 0.21)	-0.50 (-1.01, 0.01)	0.13 (-0.46, 0.72)	0.66
5th week	-0.68 (-1.18, -0.19)	-0.55 (-1.11, 0.02)	-0.22 (-0.81, 0.36)	0.45
17th week	-1.22 (-1.79, -0.65)	-0.61 (-1.22, 0.00)	-0.70 (-1.34, -0.06)	0.03
Sensation diameter at 17th week (mm) using Semmes-Weinstein monofilament test				
Thumb	-0.29 (-0.43, -0.14)	-0.17 (-0.28, -0.06)	-0.05 (-0.21, 0.11)	0.53
First finger	-0.28 (-0.41, -0.15)	-0.12 (-0.22, -0.01)	-0.08 (-0.22, 0.06)	0.26
Middle finger	-0.28 (-0.40, -0.15)	-0.13 (-0.24, -0.01)	-0.11 (-0.26, 0.04)	0.15
Little finger	-0.15 (-0.26, -0.03)	-0.14 (-0.26, -0.03)	-0.02 (-0.16, 0.12)	0.76
Dellon-modified Moberg pick-up test completion time at 17th week (seconds)				
Un-blinded	-2.11 (-4.36, 0.13)	-0.80 (-3.21, 1.61)	-1.87 (-4.61, 0.88)	0.18
Blinded	-6.50 (-9.84, -3.15)	-0.32 (-4.27, 3.63)	-6.13 (-10.6, -1.63)	<0.01
Tip pinch strength at 17th week (lbs)	1.75 (1.27, 2.22)	0.52 (-0.02, 1.06)	1.17 (0.48, 1.86)	<0.01

Results

A total of 181 patients were randomly allocated to electroacupuncture plus night splinting (n=90) or the waiting list plus night splinting (n=91). The two groups were comparable in baseline characteristics, with a mean duration of symptoms of 50 and 51 months, respectively. Patient recruitment flowchart and reasons for drop-out are shown in the Figure.

Boston Carpal Tunnel Questionnaire

Patients in the electroacupuncture group achieved greater improvement in the Symptom Severity Scale score at the 5th (P=0.04) and 17th (P=0.02) week (Table 1), with a higher proportion of patients achieving clinically important improvement (47% vs 36%, Table 2). Patients in the electroacupuncture group also achieved greater improvement in the Functional Status Scale score at the 17th week (P=0.01, Table 1), with a higher proportion of patients achieving clinically important improvement (35% vs 24%, Table 2).

Disabilities of the Arm, Shoulder, and Hand questionnaire

Patients in the electroacupuncture group achieved greater improvement in DASH score at the 17th week (P<0.01, Table 1), with a higher proportion of patients achieving clinically important improvement (47% vs 29%, Table 2).

Pain intensity

Patients in the electroacupuncture group experienced a greater reduction in pain at the 17th week (P<0.03) although the magnitude of effect was modest (Table 1).

Dexterity, strength, and sensation

Patients in the electroacupuncture group had a

TABLE 2. Proportion of patients achieving clinically important improvement*

Outcome	No. (%) of patients	
	Electroacupuncture plus night splinting group	Waiting list plus night splinting group
Boston Carpal Tunnel Questionnaire		
Symptom Severity Scale		
1st week	11 (12)	19 (21)
2nd week	19 (21)	23 (26)
5th week	33 (39)	27 (31)
17th week	40 (47)	32 (36)
Functional Status Scale		
1st week	7 (8)	17 (19)
2nd week	15 (17)	15 (17)
5th week	19 (22)	18 (20)
17th week	30 (35)	21 (24)
Disabilities of the Arm, Shoulder, and Hand Questionnaire		
1st week	7 (8)	16 (18)
2nd week	17 (19)	19 (22)
5th week	24 (28)	21 (24)
17th week	40 (47)	26 (29)
Pain intensity		
1st week	18 (20)	20 (23)
2nd week	21 (24)	24 (28)
5th week	27 (32)	28 (32)
17th week	34 (40)	31 (35)
Blinded Dellon-modified Moberg pick-up test completion time at 17th week	32 (37)	17 (19)
Tip pinch strength at 17th week	39 (46)	32 (36)

* The minimal threshold is defined as a half of the baseline standard deviation for the Boston Carpal Tunnel Questionnaire, Disabilities of the Arm, Shoulder, and Hand Questionnaire, and Dellon-modified Moberg pick-up test, as well as 1.66 lbs for tip pinch strength and 2 for pain intensity on a numerical rating scale

shorter completion time in the blinded DMMPUT at the 17th week (P<0.01, Table 1), with a higher proportion of patients achieving clinically important improvement (37% vs 19%, Table 2). The two groups did not differ significantly in terms of the un-blinded DMMPUT completion time.

Patients in the electroacupuncture group had stronger tip pinch strength (P<0.01, Table 1), with a higher proportion of patients achieving clinically important improvement (46% vs 36%, Table 2). The two groups did not differ significantly in sensation.

All adverse events were resolved within a week; none was serious.

Discussion

The UK National Institute for Health and Care Excellence (NICE),[1] American Academy of Orthopaedic Surgeons,[2] and the American College of Occupational and Environmental Medicine[3] recommend splinting as the first-line conservative treatment strategy for CTS, and make no recommendation for or against electroacupuncture. In this trial, most patients had chronic symptoms for more than 2 years and moderate severity at enrolment. Splinting alone was inadequate to relieve symptoms and improve function, as none of the outcomes demonstrated a clinically important improvement from baseline in intention-to-treat analyses. The UK NICE guideline recommends the use of steroid injection or surgery if conservative treatment fails to improve symptoms after 3 months. There is no consensus on optimal treatment for patients with chronic (≥6 months) mild-to-moderate symptoms.[4] Results from this trial can provide evidence of the potential benefit of adding electroacupuncture to splinting for CTS patients with chronic mild-to-moderate symptoms as first-line therapy. Future trials may also evaluate the add-on benefit of acupuncture on top of steroid injections.[5]

Acknowledgement

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Results of this study have been published in: Chung VC, Ho RS, Liu S, et al. Electroacupuncture and splinting versus splinting alone to treat carpal tunnel syndrome: a randomized controlled trial. CMAJ 2016;188:867-75.

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