Effectiveness of hand therapy interventions in primary management of carpal tunnel syndrome: a systematic review

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CRD summary
This fairly well-conducted review assessed the effectiveness of different interventions for the treatment of carpal tunnel syndrome (CTS). The most reliable evidence was found for splinting, ultrasound, nerve gliding exercises, carpal bone mobilisation, magnetic therapy and yoga. As the results were based on lower quality studies, the authors’ recommendations for research appear appropriate to determine the relative merits of different interventions.

Authors’ objectives
To investigate the effectiveness of hand therapy interventions for carpal tunnel syndrome (CTS) in patients without prior surgical treatment.

Searching
Electronic databases were searched for peer-reviewed, English language articles as follows: MEDLINE from January 1966 to January 2003; CINAHL from January 1982 to January 2003; EMBASE from January 1980 to January 2003; the Cochrane Controlled Trials Register from January 1964 to January 2003; PEDro from January 1992 to January 2003; a Wilson Business index from July 1982 to January 2003; and ERIC from July 1989 to January 2003. The search terms were reported. Time constraints meant that handsearches for additional material and author contact (where relevant) were not carried out.

Study selection
Study designs of evaluations included in the review
All study designs were eligible for inclusion. The majority of included studies were randomised controlled trials (RCTs); others were cohort studies and case series.

Specific interventions included in the review
Studies of one or more physiotherapeutic (treatment) interventions used by physiotherapists, hand therapists or occupational therapists to treat CTS were eligible for inclusion. The included interventions were splinting, ultrasound, nerve gliding exercises, splinting plus nerve and tendon gliding exercises, magnetic therapy, low-level laser therapy, yoga, manual therapy, acupuncture and combined therapies. A range of different intervention components, duration and frequency of administration was noted.

Participants included in the review
Studies of participants aged 18 years and over, with a diagnosis of (non-traumatic) CTS and without previous surgical treatment for the condition, were eligible for inclusion. The included participants (men and women) had a mean age between 29 and 75 years, and the severity of their condition was mixed. The duration of symptoms ranged from 4 weeks to 35 years. One study reported that some participants had received previous surgery.

Outcomes assessed in the review
There were no specific inclusion criteria relating to the outcomes. A wide range of outcomes were measured in the review, including general improvement, sleep, symptom severity and function, pain and nerve conduction.

How were decisions on the relevance of primary studies made?
Five researchers were involved in the decision-making process. Studies were judged for relevance at 3 stages: title, abstract and article. Two different reviewers assessed the titles and any disagreements at this stage meant that the paper progressed to the abstract stage. Abstracts were randomised to and independently assessed by two different reviewers, following which the included abstracts were re-randomised to two new reviewers. Each reviewer independently assessed the full papers.
Assessment of study quality
The validity of the primary studies was assessed using 24 evaluation criteria contained within the Structured Effectiveness Quality Evaluation Scale (SEQES) and graded according to Sackett's Levels of Evidence. Based on SEQES criteria, studies were rated 'low', 'moderate' or 'high' quality. Two reviewers independently assessed the study for validity and any disagreements were resolved by consensus. A third reviewer was involved in the event that agreement could not be reached.

Data extraction
The reviewers who carried out the relevance and validity appraisal extracted the data using a specific section of the SEQES. The results were extracted as absolute change and level of significance.

Methods of synthesis
How were the studies combined?
The studies were combined in narrative form and weighted according to the SEQES score and Sackett's Levels of Evidence grading criteria.

How were differences between studies investigated?
Differences between the studies were discussed narratively according to intervention type.

Results of the review
Twenty-four studies involving 1,245 participants (1,205 hands) were included in the review: 11 RCTs (561 participants; 404 hands), 6 cohort studies (334 participants; 388 hands), 6 case series (279 participants; 301 hands) and one other study of unspecified design (71 participants; 112 hands).

The results were based largely on low-quality studies and were reported at a significance level of P less than 0.05. The most reliable evidence was as follows.

Based on 9 studies (RCTs, cohort and case series designs) that focused on the use of splinting, the results showed a decrease in symptom severity (night splinting alone) and improvements in median nerve conduction (full time splinting). Wrist immobilisation was noted to be the most important factor in this process, given that various types of splints and angles of mobilisation were found to be effective. The results of 2 RCTs of ultrasound showed that deep pulsed ultrasound (20 treatments for 15 minutes) was effective in reducing pain, paresthesia and sensory loss, and in improving median nerve conduction and strength. Two RCTs looking at nerve gliding found reductions in pain and increases in active range of motion of wrist extension and flexion. Pinch grip strength was also improved when splinting was added to nerve and tendon gliding exercises. Prolonged magnetic therapy (in wrist support wraps) in 2 RCTs was noted to reduce symptom severity and increase median nerve conduction. Yoga (1 RCT) was supported as an effective intervention in terms of reductions in median nerve dysfunction. Manual therapy (2 RCTs) was found to have beneficial effects in the reduction of pain, although confounding from concurrent interventions was a possibility. Studies of combined therapies revealed no improvements in nerve conduction, physical or mental distress, or sensation when compared with the use of night splinting and non-steroidal anti-inflammatory drugs.

Authors' conclusions
The best available evidence for the effectiveness of CTS interventions was in relation to splinting, deep pulsed ultrasound, nerve gliding exercises, carpal bone mobilisation, magnetic therapy and yoga.

CRD commentary
The question and inclusion criteria in relation to the interventions, participants and study design were clearly stated for this review. However, the included interventions possessed a broad range of characteristics and there was little information on the participants. The reported time constraints (as acknowledged by the authors) and consequent search
strategy for publications in English may mean that potentially relevant studies could have been missed. Attempts were made to reduce bias in the review process and a sound basis was presented for the validity assessment of the included studies. The data were synthesised by intervention type, and the authors drew appropriate attention to the more reliable evidence upon which their conclusions were drawn.

**Implications of the review for practice and research**

**Practice:** The authors stated that the results of this review should be considered in relation to the individual patient characteristics.

**Research:** The authors stated that high-quality research is now needed to compare the interventions highlighted as having stronger evidence of effectiveness in this review. The potential incremental benefits of different therapies, along with an appropriate economic evaluation, should be part of this future research. The authors also proposed more investigation into the link between patient characteristics (in terms of natural or occupational causal factors of CTS) and response to different treatments.

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