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Rehabilitation following carpal tunnel release (Review) — Source link

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Published on: 05 Jun 2013 - Cochrane Database of Systematic Reviews (John Wiley and Sons)

Topics: Rehabilitation, Clinical trial, Functional ability and Standard treatment

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[Intervention Review]

Rehabilitation following carpal tunnel release

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Editorial group: Cochrane Neuromuscular Group.
Publication status and date: New, published in Issue 6, 2013.
Review content assessed as up-to-date: 3 April 2012.

Citation: Peters S, Page MJ, Coppieters MW, Ross M, Johnston V. Rehabilitation following carpal tunnel release. *Cochrane Database of Systematic Reviews* 2013, Issue 6. Art. No.: CD004158. DOI: 10.1002/14651858.CD004158.pub2.

ABSTRACT

Background

Various rehabilitation treatments may be offered following carpal tunnel syndrome (CTS) surgery. The effectiveness of these interventions remains unclear.

Objectives

To review the effectiveness of rehabilitation following CTS surgery compared with no treatment, placebo, or another intervention.

Search methods

On 3 April 2012, we searched the Cochrane Neuromuscular Disease Group Specialized Register (3 April 2012), CENTRAL (2012, Issue 3), MEDLINE (January 1966 to March 2012), EMBASE (January 1980 to March 2012), CINAHL Plus (January 1937 to March 2012), AMED (January 1985 to April 2012), LILACS (January 1982 to March 2012), PsycINFO (January 1806 to March 2012), PEDRO (29 January 2013) and clinical trials registers (29 January 2013).

Selection criteria

Randomised or quasi-randomised clinical trials that compared any postoperative rehabilitation intervention with either no intervention, placebo or another postoperative rehabilitation intervention in individuals who had undergone CTS surgery.

Data collection and analysis

Two reviewers independently selected trials for inclusion, extracted data and assessed the risk of bias according to standard Cochrane methodology.

Main results

In this review we included 20 trials with a total of 1445 participants. We studied different rehabilitation treatments including: immobilisation using a wrist orthosis, dressings, exercise, controlled cold therapy, ice therapy, multimodal hand rehabilitation, laser therapy, electrical modalities, scar desensitisation, and arnica. Three trials compared a rehabilitation treatment to a placebo comparison; three trials compared rehabilitation to a no treatment control; three trials compared rehabilitation to standard care; and 14 trials compared various rehabilitation treatments to one another.

Overall, the included studies were very low in quality. Eleven trials explicitly reported random sequence generation and, of these, three adequately concealed the allocation sequence. Four trials achieved blinding of both participants and outcome assessors. Five studies were at high risk of bias from incompleteness of outcome data at one or more time intervals. Eight trials had a high risk of selective reporting bias.

The trials were heterogenous in terms of the treatments provided, the duration of interventions, the nature and timing of outcomes measured and setting. Therefore, we were not able to pool results across trials.

Four trials reported our primary outcome, change in self reported functional ability at three months or longer. Of these, three trials provided sufficient outcome data for inclusion in this review. One small high quality trial studied a desensitisation program compared to standard treatment and revealed no statistically significant functional benefit based on the Boston Carpal Tunnel Questionnaire (BCTQ) (MD -0.03; 95% CI -0.39 to 0.33). One moderate quality trial assessed participants six months post surgery using the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire and found no significant difference between a no formal therapy group and a two-week course of multimodal therapy commenced at five to seven days post surgery (MD 1.00; 95% CI -4.44 to 6.44). One very low quality quasi-randomised trial found no statistically significant difference in function on the BCTQ at three months post surgery with early immobilisation (plaster wrist orthosis worn until suture removal) compared with a splint and late mobilisation (MD 0.39; 95% CI -0.45 to 1.23).

The differences between the treatments for the secondary outcome measures (change in self reported functional ability measured at less than three months; change in CTS symptoms; change in CTS-related impairment measures; presence of iatrogenic symptoms from surgery; return to work or occupation; and change in neurophysiological parameters) were generally small and not statistically significant. Few studies reported adverse events.

Authors' conclusions

There is limited and, in general, low quality evidence for the benefit of the reviewed interventions. People who have had CTS surgery should be informed about the limited evidence of the effectiveness of postoperative rehabilitation interventions. Until the results of more high quality trials that assess the effectiveness and safety of various rehabilitation treatments have been reported, the decision to provide rehabilitation following CTS surgery should be based on the clinician's expertise, the patient's preferences and the context of the rehabilitation environment. It is important for researchers to identify patients who respond to a certain treatment and those who do not, and to undertake high quality studies that evaluate the severity of iatrogenic symptoms from the surgery, measure function and return-to-work rates, and control for confounding variables.

PLAIN LANGUAGE SUMMARY

Rehabilitation following carpal tunnel release

Carpal tunnel syndrome (CTS) is a condition in which a nerve that runs through a tunnel in the wrist is compressed. This leads to pain, numbness and tingling in the hand and sometimes into the forearm. In advanced stages, some patients experience weakness and muscle wasting in the hand. CTS is more common in women and individuals with certain risk factors, such as diabetes, obesity, arthritis, older age, working in certain occupations and having a previous wrist fracture. Many people undergo surgery to reduce the pressure on the nerve and to improve pain, sensation and hand function. Sometimes individuals receive rehabilitation following CTS surgery. Rehabilitation treatments are believed to speed up recovery and manage pain or symptoms from the surgery itself. On 3 April 2012, we searched for all relevant clinical trials in which a rehabilitation treatment was compared to another rehabilitation treatment, no treatment or placebo (sham treatment). We found 20 trials with a total of 1445 participants that assessed the benefits and harms of different rehabilitation treatments following CTS surgery. Based on these studies, we found limited and low quality evidence for the benefit of the reviewed treatments including: immobilisation with a wrist orthosis (splint), dressings used post surgery, exercise, cold and ice therapy, different types of hand rehabilitation in combination, laser therapy, electrical treatments, scar desensitisation, and arnica. Few studies reported on the safety of these treatments. More research is needed to investigate the effectiveness and safety of the various types of rehabilitation treatments available for people following CTS surgery.

BACKGROUND

Description of the condition

Carpal tunnel syndrome (CTS) is a neurological condition resulting from compression of the median nerve at the wrist due to increased pressure within the carpal tunnel (AAOS 2007; Phalen 1966). Patients with CTS usually present with sensory or motor symptoms, or both, in the hand and wrist. Patients often experience pain, paraesthesia or numbness in the distal distribution of the thumb, index, middle and radial half of the ring finger (Phalen 1966; Rempel 1998). Extramedian spread of sensory and pain symptoms has been reported in 37.5% of patients (Zanette 2010). In advanced stages, wasting of the thenar muscles and hand weakness is observed (Ibrahim 2012).

CTS is one of the most common disorders of the upper extremity (AAOS 2007). The prevalence of CTS in the general population is 3.8% when diagnosed clinically and 2.7% when diagnosed neurophysiologically (Atroshi 1999). There is a higher prevalence in women than in men (Gelfman 2009). Whilst some authors have indicated that occupational risk factors, such as vibration, force and repetition (Barcenilla 2012; Burt 2011; Herbert 2000); and certain occupations (Armstrong 2008; Kim 2004; Wyatt 2012) contribute to CTS, there is still some controversy regarding its work-relatedness (Stapleton 2006). Other risk factors for CTS have been suggested, such as obesity, diabetes, previous wrist fracture and arthritis (Geoghegan 2004; Lam 1998; Palmer 2007; Van Rijn 2009).

CTS can be treated both nonsurgically (conservatively) or surgically. Conservative treatment options are usually offered to individuals who experience milder or intermittent symptoms, are pregnant, or who cannot or choose not to have surgery (Page 2012a). Many different nonsurgical interventions may be offered, including therapeutic ultrasound, splinting, exercise prescription, mobilisation techniques, ergonomic modification, oral medication, corticosteroid injections, vitamins and complementary therapies (Marshall 2007; O'Connor 2012; Page 2012a; Page 2012b; Page 2012c). Few have any proven therapeutic benefit.

CTS surgery is most commonly referred to as carpal tunnel release (CTR). CTR may be indicated for individuals with persistent symptoms that have not responded to conservative management, those presenting with more severe symptoms (such as frequent numbness or thenar muscle wasting) or those with electrophysiologically severe disease (Scholten 2007; Verdugo 2008). Surgery involves the division of the transverse carpal ligament to increase the volume of the carpal tunnel, thereby reducing pressure on the median nerve (Aroori 2008). In the United States of America, approximately 40% of patients with CTS are treated operatively (Wilson 2003), whilst 31% of persons with CTS have surgery in the United Kingdom (Latinovic 2006). CTR has a reported long-term success rate of 75% to 90% (Louie 2012).

Two surgical approaches are commonly used to release the transverse carpal ligament: open CTR and endoscopic CTR. Open CTR divides the carpal tunnel ligament using a palmar incision. In recent years, minimal-incision-open (or mini-open) techniques have become more common in an attempt to minimise surgical trauma, iatrogenic symptoms from the surgery and recovery time (Bromley 1994). Over time, several variations of these techniques have developed to reduce postoperative pain, improve function and shorten recovery time. A number of secondary procedures may be performed concurrently. These include techniques such as epineurotomy, internal neurolysis, synovectomy and reconstruction of the transverse carpal ligament (Huisstede 2010). Endoscopic CTR (ECTR) involves division of the transverse carpal ligament whilst leaving the overlying structures intact. This is believed to reduce postoperative pain and scarring and hasten early return to function and work (Sanati 2011). Two techniques are commonly used for ECTR: the single portal technique (Agee 1992) and the two portal technique (Chow 1989).

Complications following CTR may include nerve injury, neuroma formation, palmar arch injury, hematomas, complex regional pain syndrome, tendon adhesions, bowstringing of the flexor tendons, pillar pain, scar pain and other iatrogenic complications as a result of the surgery (Braun 2002). Furthermore, symptoms of CTS may recur or persist following surgical release (Gerritsen 2001; Hunter 1991; Idler 1996). Reasons for persistence of symptoms following surgical release include incorrect diagnosis, inadequate decompression of the median nerve, iatrogenic compression or nerve injury, double crush syndrome, and end-stage disease (Idler 1996; Louie 2012). The prognosis following CTS has been associated with a number of factors, such as age, psychological factors, workers compensation, duration of CTS symptoms, presence of thenar atrophy and absence of sensory and motor nerve conduction (Amick 2004; Bland 2001; Cowan 2012; Finestone 1996). The presence of other disorders, such as rheumatoid arthritis and diabetes, may also affect the prognosis (DeStefano 1997).

Description of the intervention

Various rehabilitation treatments may be recommended following CTR. These interventions are believed to expedite recovery by improving mobility, strengthening the hand and promoting earlier return to function and work (Pomerance 2007; Provinciali 2000). Interventions may also be prescribed to manage the iatrogenic symptoms of the surgery including control of postoperative swelling, scar desensitisation, management of pillar pain and wound healing (Janssen 2009; Powell 2003; Ritting 2012). Therefore, postoperative rehabilitation might include interventions such as provision of advice, exercise prescription, mobilisation techniques, splinting of the wrist using an orthosis, wound and scar management, oedema management, electrotherapy, cryotherapy, desensitisation, ergonomic modification, strengthening and work

modification (Groves 1989; Nathan 1993). These interventions may be provided as stand-alone interventions or as part of a program of rehabilitation treatments.

How the intervention might work

The goal of postoperative rehabilitation is to speed up and enhance symptom resolution and functional recovery following surgery. Various arguments in support of the individual rehabilitative techniques have been reported. For instance, immobilisation of the wrist with an orthosis has been recommended to minimise postoperative pain, wound dehiscence, nerve entrapment, and prevent bowstringing of the flexor tendons (Bury 1995; Jessurun 1988). Laser therapy and modalities that use electrical stimulation have been advocated to stimulate wound healing, neuronal regeneration and control pain postoperatively (Alves 2011; Gordon 2010). Lighter postoperative dressings are advocated to allow easier and earlier mobilisation of the hand and wrist (Ritting 2012). Advocates of early mobilisation following surgery propose that motion of the wrist and digits promotes longitudinal gliding of the median nerve through the surgical bed and prevents adhesion formation between the nerve and flexor tendons (Nathan 1993; Skirven 1994). Oedema management techniques are used to minimise the inflammatory response on digital range of motion (Hayes 2002). Scar management techniques, such as massage, pressure, and the application of silicon-based products, are advocated to loosen adhesions between skin and underlying tissues, aid in the desensitisation of the incisional scar and promote scar remodelling (Hayes 2002; Powell 2003). Strengthening exercises and progressive functional activities are incorporated into the rehabilitative program to maximise occupational performance following surgery (Hayes 2002; Nathan 1993). Some authors advocate the use of comprehensive multi-component therapy programs (consisting of various rehabilitation treatments, such as advice, mobilisation and management of iatrogenic symptoms from the surgery by physiotherapists or occupational therapists who specialise in hand therapy) to promote early return to function and work (Nathan 1993). Nathan 1993 also found that compliance with hand therapy was the strongest prognostic factor for early return to function and work.

Why it is important to do this review

The evidence base for rehabilitation following CTR has grown. Three reviews of specific treatments following CTR have been published (Huisstede 2010; Isaac 2010; Keilani 2002). Cochrane systematic reviews of various nonsurgical interventions (Marshall 2007; O'Connor 2012; Page 2012a; Page 2012b; Page 2012c) and surgical treatment options (Scholten 2007; Verdugo 2008) for CTS already exist. However, no Cochrane systematic review on rehabilitation treatments following surgical management of CTS has been conducted. There are many rehabilitation treatments which may be offered to patients who have had CTR. As there is limited evidence or guidelines for the use of any of these interventions, a Cochrane systematic review is warranted.

OBJECTIVES

The objective of this review was to compare the effectiveness and safety of various rehabilitation treatments provided following CTR with no treatment, placebo or another treatment.

METHODS

Criteria for considering studies for this review

Types of studies

All published and unpublished studies using or attempting to use a randomised methodology that compared a postoperative treatment with no treatment (or a placebo) or with another rehabilitation treatment.
We excluded studies that compared surgery to rehabilitation interventions or any interventions provided before surgery and interventions that were not considered to be a rehabilitation treatment, for example postoperative analgesia. There were no restrictions by year of publication or language.

Types of participants

All participants with a diagnosis of CTS (as defined by the authors of each study) who underwent CTR, either endoscopically or with any form of open technique.

Types of interventions

All postoperative rehabilitation treatments including: the provision of advice, exercise, use of a hand or wrist orthosis, scar management, oedema management, electrotherapy, desensitisation, ergonomic modification, work modification, exercise prescription and return-to-work interventions.
We excluded any intervention that occurred before surgery or at the time of surgery, for example, type of anaesthetic or suture type. We also excluded postoperative analgesia.

Types of outcome measures

We modified outcomes from the original protocol (O'Connor 2003) for this review. We have detailed changes in the section Differences between protocol and review.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale (for example, Functional Scale from the Boston Carpal Tunnel Questionnaire (BCTQ) or Disabilities of the Arm, Shoulder and Hand questionnaire (DASH)). Long-term was defined as three months or longer.

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale (for example, Functional Scale from BCTQ or DASH). Short-term was defined as less than three months;
2. Short-term (less than three months) and long-term (three months or more) change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia);
3. Short-term (less than three months) and long-term (three months or more) change in CTS related impairment measures (for example, grip and pinch strength);
4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring and pillar pain) at short-term (less than three months) and long-term (three months or more) follow-up;
5. Return to work or occupation (measured as 'yes' or 'no') at three months;
6. Short-term (less than three months) and long-term (three months or more) change in neurophysiologic parameters (using nerve conduction studies);
7. Presence of adverse events as a result of the rehabilitation at short-term (less than three months) and long-term (three months or more) follow-up.

Search methods for identification of studies

Electronic searches

On 3 April 2012, we searched the Cochrane Neuromuscular Disease Group Specialized Register (3 April 2012) for randomised trials using 'carpal tunnel syndrome' and 'rehabilitation' as the primary search terms. In addition, we searched CENTRAL (2012 Issue 3 in the Cochrane Library), MEDLINE (January 1966 to March 2012), EMBASE (January 1980 to March 2012), CINAHL Plus (January 1937 to March 2012), AMED (January 1985 to January 2012), LILACS (January 1982 to March 2012), PsycINFO (January 1806 to March 2012), PEDRO (January 1999 to January 2013), WHO International Clinicial Trials Registry Platform (ICTRP) (29 January 2013), UK Clinical Research Network Study Portfolio (5 April 2012) and ClinicalTrials.gov Database (29 January 2013).

The detailed search strategies are detailed in the appendices: Appendix 1 (MEDLINE), Appendix 2 (EMBASE), Appendix 3 (AMED), Appendix 4 (PsycINFO), Appendix 5 (CINAHL Plus), Appendix 6 (LILACS) and Appendix 7 (CENTRAL), PEDRO (Appendix 8).

Searching other resources

We searched bibliographies of relevant trials identified by this strategy. Where possible, we contacted authors of identified papers to determine whether other published or unpublished trials were available.

Data collection and analysis

The review authors followed the recommended strategies for data collection and analysis documented in Chapters 7 and 9 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011).

Selection of studies

Two review authors independently selected the trials for possible inclusion against a predetermined checklist of inclusion criteria (see Criteria for considering studies for this review). Each review author independently examined the titles and abstracts of trials for possible inclusion identified from the search and categorised studies into the following groups.

- Possibly relevant: studies that met the inclusion criteria and studies from which it was not possible to determine whether they met the criteria either from their title or abstract.
- Excluded: studies that did not meet the inclusion criteria.

The two review authors then independently reviewed the full text of all studies for possible relevance. Each of these review authors compiled a list of trials that met the inclusion criteria. The review authors compared the lists and a third review author resolved any discrepancies that could not be resolved through discussion.

Data extraction and management

The two review authors independently extracted the data using a data extraction form specifically developed for this review. The authors resolved any discrepancies through discussion until consensus was reached. We piloted and accordingly modified the data extraction form prior to its use. In addition to collecting the relevant data to perform the risk of bias assessment and study results, we collected the following information for each study:

- details of the participant sample (age, sex, diagnostic criteria used to confirm CTS, severity of symptoms, duration of symptoms, details of surgical intervention, recruitment method, inclusion and exclusion criteria, number of participants or wrists randomised);
- types of interventions used and comparison groups (description of interventions, method of delivery, duration);
- outcome measures (description and timing).

Two review authors compiled all comparisons and entered the outcome data into the Cochrane statistical software (Review Manager 5.2 (RevMan 2012)) for meta-analysis. Another review author cross-checked the entered data for accuracy. One review author obtained missing data from the trial authors wherever possible. When these efforts were unsuccessful, we included the study in the review and described it fully, but did not include it include in the meta-analysis. We entered a description of this process in the notes section of the Characteristics of included studies table.

Assessment of risk of bias in included studies

Two review authors independently assessed the included trials using the 'Risk of bias' tool described in Chapter 8 of the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). We assessed the following items:

- random sequence generation;
- allocation concealment;
- blinding of participants and study personnel;
- blinding of outcome assessment;
- incomplete outcome data (defined separately for data measured at less than three months, and three months or more);
- selective reporting;
- other sources of bias.

We rated each item as at 'Low risk', 'Unclear risk', or 'High risk' of bias. When criteria were unclear, one review author attempted to obtain further information from the authors of the trial. The review authors resolved any discrepancies by discussion.

Measures of treatment effect

We expressed results as risk ratios (RR) with 95% confidence intervals (CI) for dichotomous outcomes and mean differences (MD) with 95% CIs for continuous outcomes if the same measurement tool was used across separate studies. Alternatively, we used the standardised mean difference (SMD) when studies measured the same outcome with different measurement tools.

Unit of analysis issues

As CTS can affect either one or both hands, a unit of analysis error can occur if an appropriate statistical analysis is not used (Stanek 1996). Hence, we sought information about the unit of randomisation (participants or wrists). In studies that randomised wrists, we sought information about whether, in participants with bilateral CTS, each wrist was allocated to a different treatment, or whether there was no such constraint. Given that results are unlikely to be independent for wrists from the same participant, we assessed how the investigators accounted for this in their analyses (for example, use of paired or matched analyses, generalised estimating equations). If reports did not include this information, we contacted trialists for clarification. We also requested individual wrist outcome data from trialists to re-analyse the data.

Dealing with missing data

We sought missing information about study design, outcome data, or attrition rates such as drop-outs, losses to follow-up and withdrawn study participants from the authors of included studies by either mail or email. We indicated all unpublished data obtained from the trial authors in the relevant sections of this review.

Assessment of heterogeneity

The review authors assessed clinical heterogeneity by determining whether the characteristics of participants, interventions, outcome measures and timing of outcome measurement were similar across studies. We assessed statistical heterogeneity using the Chi^2 statistic and the I^2 test (Higgins 2011).
We interpreted the I^2 statistic using the following boundaries as an approximate guide:

- 0% to 40% might not be important heterogeneity;
- 30% to 60% may represent moderate heterogeneity;
- 50% to 90% may represent substantial heterogeneity; and
- 75% to 100% may represent considerable heterogeneity

(Deeks 2011).

Assessment of reporting biases

To assess small study effects, we intended to generate funnel plots if meta-analyses included at least 10 studies examining the same treatment comparison (Sterne 2011). To assess outcome reporting bias, we searched protocols of trials on the clinical trials register that is maintained by the US National Institute of Health (http://clinicaltrials.gov), and trials published after July 1st 2005 using the Clinical Trial Register, International Clinical Trials Registry Platform (ICTRP), World Health Organization (WHO) (http://apps.who.int/trialssearch), and compared these with the corresponding published randomised controlled trials (Dwan 2008; Dwan 2011).

Data synthesis

We performed statistical analysis using RevMan 5.2. We planned to pool results of studies with similar characteristics (participants, interventions, outcome measures and timing of outcome measurement) to provide estimates of the efficacy of specific interventions

following CTR. We planned to pool results in a meta-analysis using either a fixed-effect or random-effects model (depending on the level of clinical and methodological heterogeneity). Where data could not be combined, we presented the results as a narrative synthesis. We set statistical significance at $P < 0.05$ for primary and secondary outcome measures.

Subgroup analysis and investigation of heterogeneity

We planned the following prespecified subgroup analyses to assess the effect of the severity of symptoms and type of surgical intervention:

1. Severity of CTS symptoms (Szabo 1994):
   - early CTS, defined as intermittent symptoms, no motor impairment and normal electrophysiological tests;
   - intermediate CTS, defined as constant symptoms with abnormal electrophysiological tests, with or without motor impairment;
   - advanced CTS, defined as severe loss of sensory and motor function, the presence of thenar muscle atrophy and weakness, and abnormal electrophysiological and sensory tests.

2. Type of surgical intervention:
   - endoscopic (either single portal or double portal);
   - open;
   - minimal-incision open;
   - another carpal tunnel surgery(including secondary procedures such as epineurotomy, internal neurolysis, synovectomy or reconstruction of the transverse carpal ligament).

Sensitivity analysis

We used predetermined sensitivity analyses to assess the effect of excluding studies when (a) allocation concealment was rated as inadequate, not used or unclear (and attempts to clarify with authors failed); (b) blinding of outcome assessment was not done or was rated as unclear (and attempts to clarify with authors failed); and (c) intention-to-treat analysis was not performed or was unclear (and attempts to clarify with authors failed). These quality criteria have been shown to influence estimates of treatment effects (Jüni 2001).

RESULTS

Description of studies

Results of the search

The searches conducted to April 2012 identified a total of 676 records. Table 1 reports the number of records retrieved by each search strategy. There were 472 records after removal of duplicates. We retrieved 18 potentially relevant articles from other sources (including 17 studies from clinical trials registries). We retrieved no articles from the reference lists of potentially eligible studies. From the 676 records, a total 30 full-text papers were selected for review. Of these, 20 studies met the inclusion criteria and were included in this review. Four studies are awaiting assessment (Chaise 1994; NCT00845325; NCT00435149; Gordon 2007), as these studies have not yet been fully completed, require translation or we require further information to assess their eligibility(see Characteristics of studies awaiting classification). A flow diagram of the study selection process is presented in Figure 1.

Figure 1. Study flow diagram.

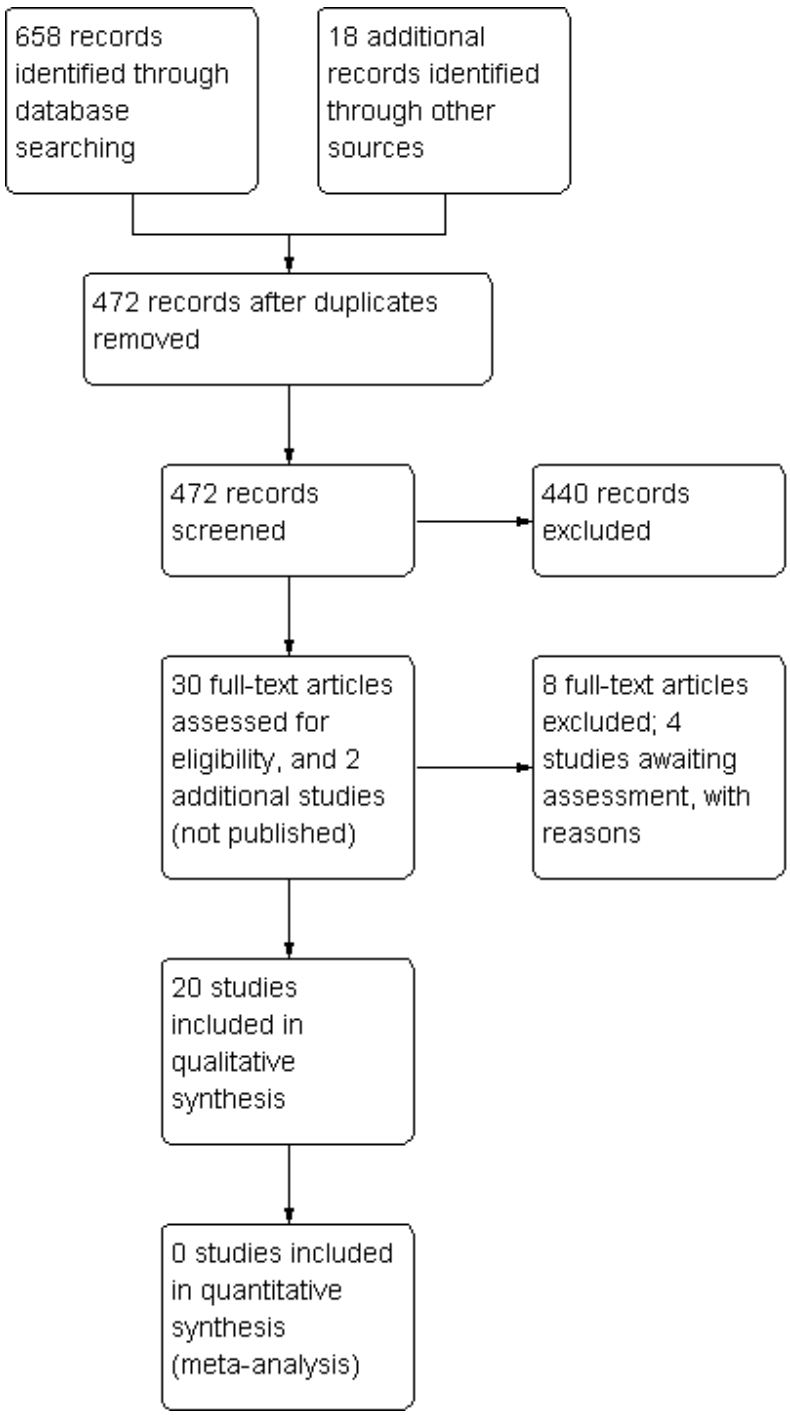


Table 1

Database	Period Searched	Date Searched	Number of Hits
MEDLINE	January 1966 to March 2012	03 April 2012	260
CINAHL PLUS	January 1937 to March 2012	03 April 2012	81
EMBASE	January 1980 to March 2012	03 April 2012	166
AMED	January 1985 to March 2012	03 April 2012	20
LILACS	January 1982 to March 2012	03 April 2012	25
CENTRAL	2012, Issue 3	03 April 2012	171
PsychINFO	January 1806 to March 2012	03 April 2012	2
Cochrane Neuromuscular Disease Group Specialized Register	03 April 2012	03 April 2012	100
ClinicalTrials.gov (www.clinicaltrials.gov)	29 January 2013	05 April 2012	69
Current Controlled Trials Register (UK Trials) (www.controlled-trials.com)	29 January 2013	05 April 2012	24
PEDRO	January 1999 to January 2013	29 January 2013	78
WHO ICTRP (http://www.who.int/ictrp/en/)	29 January 2013	29 January 2013	95

Included studies

Twenty trials met the inclusion criteria and are described in full in the Characteristics of included studies. There was a total of 1445 participants in the included studies, consisting of 279 male and 685 female participants (demographic data were missing for 481 participants). The trials presented findings across nine treatments: immobilisation using a wrist orthosis, dressings, exercise, controlled cold therapy, ice therapy, multimodal hand rehabilitation, laser therapy, electrical modalities, scar desensitisation, and arnica. The rehabilitation interventions varied in their types, intensity, duration and treatment setting. In 13 studies, participants only contributed one CTS-affected wrist to the study (Alves 2011; Cebesoy 2007; Cook 1995; Fagan 2004; Gordon 2010; Hochberg 2001; Huemer 2007; Janssen 2009; Pomerance 2007; Powell 2003; Ritting 2012; Stevinson 2003; Williams 2008). In five studies some of the participants had bilateral CTR and contributed both wrists to the analysis (Bury 1995; Finsen 1999; Jeffrey 2002; Martins 2006; Provinciali 2000). Of these, two randomised each wrist to different interventions (Finsen 1999; Martins 2006); one randomised both wrists to the same intervention (Jeffrey 2002); and the wrist allocation method was unclear in two studies (Bury 1995; Provinciali 2000). A unit of analysis error occurred in three

of these studies, as no attempt was made to control the correlation between wrists (Finsen 1999; Martins 2006; Provinciali 2000). Jeffrey 2002 avoided a unit of analysis error. However, it was unclear whether a unit of analysis error occurred in Bury 1995. In two studies, it was unclear whether any participants had bilateral CTS (Bhatia 2000; Li 2008), so a unit of analysis error may have occurred.

Four of the 20 included studies reported the primary outcome for this review at three months or longer (Cebesoy 2007; Gordon 2010; Pomerance 2007; Powell 2003). However, only three studies (Cebesoy 2007; Pomerance 2007; Powell 2003) reported data in a meaningful format that allowed entry into RevMan.

Secondary outcomes were reported as follows: short-term change in self reported functional ability at less than three months was reported in four studies (Cebesoy 2007; Cook 1995; Powell 2003; Williams 2008); change in CTS clinical symptoms was the most common outcome, reported in 15 studies (Alves 2011, Bhatia 2000; Bury 1995; Cebesoy 2007; Cook 1995; Finsen 1999; Gordon 2010; Hochberg 2001; Huemer 2007; Jeffrey 2002; Martins 2006; Pomerance 2007; Powell 2003; Stevinson 2003; Williams 2008); change in CTS impairment measures (either grip or pinch strength or impairment in sensation) was measured in nine studies (Bury 1995; Cook 1995; Finsen 1999;Gordon 2010; Huemer 2007; Janssen 2009; Jeffrey 2002; Pomerance 2007; Ritting 2012); presence of iatrogenic symptoms related to CTR was assessed in 10 studies (Alves 2011; Cook 1995; Fagan 2004; Finsen 1999; Hochberg 2001; Huemer 2007; Jeffrey 2002; Martins 2006; Powell 2003; Stevinson 2003); return to work or occupation was measured in six studies, although the time interval was not always adequately defined (Alves 2011; Bury 1995; Cook 1995; Finsen 1999; Pomerance 2007; Provinciali 2000); change in neurophysiological parameters (nerve conduction studies) was recorded in two studies (Gordon 2010; Huemer 2007); and adverse events related to the rehabilitation intervention were reported in ten studies (Alves 2011; Bury 1995; Cebesoy 2007; Huemer 2007; Jeffrey 2002; Pomerance 2007; Powell 2003; Ritting 2012; Stevinson 2003; Williams 2008). In some studies, adverse events were reported as iatrogenic symptoms of the surgery, not adverse events of the rehabilitation intervention.

One of the studies (Powell 2003) was unpublished and the review authors obtained data entirely from unpublished sources (thesis and communication with the trial authors). We also obtained additional data not reported in the study publications from the trialists of the following studies: Alves 2011; Finsen 1999; Janssen 2009; Martins 2006; Provinciali 2000; Stevinson 2003; Williams 2008. A number of attempts to contact authors of other trials (Bhatia 2000; Bury 1995; Cook 1995; Fagan 2004; Gordon 2010; Hochberg 2001; Huemer 2007; Li 2008; Pomerance 2007; Ritting 2012) for clarification of information were unsuccessful.

Suitability of trials for meta-analysis

We were not able to statistically pool data from the included trials. This was because they were too clinically heterogeneous with respect to the type and duration of interventions and the outcome measures reported. Nine different types of postoperative rehabilitation treatments were identified in the included trials (immobilisation with wrist splint, soft bulky dressings, exercise, controlled cold therapy, ice therapy, multimodal hand rehabilitation, laser therapy, scar desensitisation and arnica). The duration of treatment varied from 48 hours (Bhatia 2000) to four weeks (Finsen 1999). In 12 trials (Bhatia 2000; Bury 1995; Cebesoy 2007; Cook 1995; Finsen 1999; Gordon 2010; Huemer 2007; Jeffrey 2002; Li 2008; Pomerance 2007; Provinciali 2000; Stevinson 2003) the data reported could not be included in the statistical analysis for a number of reasons: omission of measures of variability in reports of continuous outcomes (Bury 1995; Cook 1995; Huemer 2007; Jeffrey 2002; Pomerance 2007; Provinciali 2000), not reporting the number of participants assessed for an outcome measure (Provinciali 2000), presenting outcome data in a graphical form or other format (Gordon 2010), stating conclusions without providing supporting point estimates, measures of variability or frequency counts of outcomes (Cook 1995; Bhatia 2000; Bury 1995) or not providing CTS specific data when participants with other diagnoses were included in the study (Li 2008). Two studies reported median values and CIs indicating skewed data (Finsen 1999; Stevinson 2003) and data were not appropriate for inclusion in a standard meta-analysis.

Summary details of the trials are provided in the Characteristics of included studies.

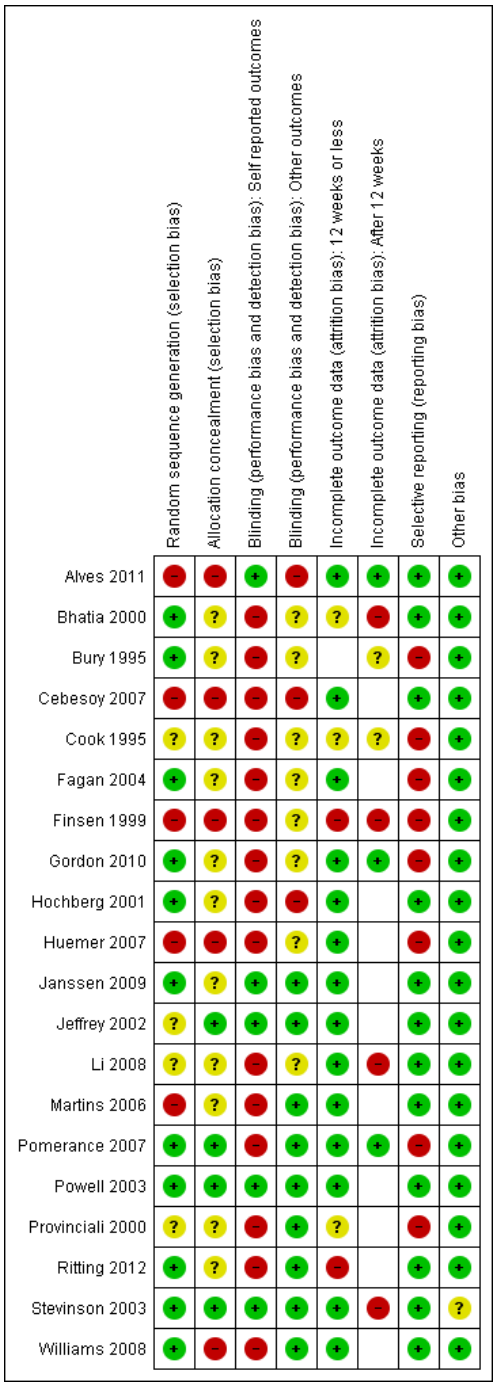
Excluded studies

In total we excluded 443 studies after screening of titles and abstracts, and excluded five studies after review of the full text publication. Reasons for exclusion of studies are provided in the Characteristics of excluded studies table. The reasons for exclusion were either non-randomised study design or that post CTR interventions were not investigated.

Risk of bias in included studies

Full details of the 'Risk of bias' assessments are available in the 'Risk of bias' tables, and a summary is presented in Figure 2. In studies where the risk of bias was rated as 'Unclear', we made attempts to contact the trial authors to request clarification or additional data.

Figure 2. Risk of bias summary: review authors' judgements about each risk of bias item for each included study. Key: red = high risk of bias; yellow = unclear risk of bias; green = low risk of bias; blank = not applicable.



Allocation

Generation of the randomisation sequence was rated as at 'low risk of bias' in 11 of the included trials (Bhatia 2000; Bury 1995; Fagan 2004; Gordon 2010; Hochberg 2001; Janssen 2009; Pomerance 2007; Powell 2003; Ritting 2012; Stevinson 2003; Williams 2008). Six of these trials (Bhatia 2000; Bury 1995; Gordon 2010; Hochberg 2001; Ritting 2012; Stevinson 2003) used random number tables for determining allocation sequence, and two trials (Fagan 2004; Williams 2008) used random envelope draw. One trial (Janssen 2009) used a technique of randomly drawing coloured cubes from a bag, and two trials (Pomerance 2007; Powell 2003) drew allocation from a box or bowl. Five of the included trials (Alves 2011; Cebesoy 2007; Finsen 1999; Huemer 2007; Martins 2006) used some form of alternation (that is, a non-random sequence). Four of the studies (Cook 1995; Jeffrey 2002; Li 2008; Provinciali 2000) did not clearly report their randomisation process and attempts to obtain this information from the trial authors were unsuccessful.

Allocation concealment was rated as at 'low risk of bias' in four of the included trials (Jeffrey 2002; Pomerance 2007; Powell 2003; Stevinson 2003). In Gupta 2011, concealment was achieved by using sequentially numbered, sealed envelopes. Jeffrey 2002 and Stevinson 2003 used an external entity to conceal the allocation. Pomerance 2007 and Powell 2003 drew allocations out of a box. Allocation concealment was rated as at 'high risk of bias' in five trials (Alves 2011; Cebesoy 2007; Finsen 1999; Huemer 2007; Williams 2008). Alves 2011 and Huemer 2007 used an alternate method for assigning allocation using odd and even numbers. Finsen 1999 used participants' social security numbers to allocate them to groups. Williams 2008 used the same pieces of paper drawn alternately from an envelope. The remaining 11 studies were rated as having an unclear risk of bias, as they either did not report any method of concealing the allocation sequence or reported only some components (Bhatia 2000; Bury 1995; Cook 1995; Fagan 2004; Gordon 2010; Hochberg 2001; Janssen 2009; Li 2008; Martins 2006; Provinciali 2000; Ritting 2012). Attempts to clarify this with the trial authors were unsuccessful.

Blinding

Five of the included studies achieved blinding of the participants and study personnel for self reported outcomes (Alves 2011; Janssen 2009; Jeffrey 2002; Powell 2003; Stevinson 2003) and were rated as having a 'low risk of bias'. This was achieved by either delivering a 'sham' or placebo intervention, most commonly with identical looking tablets or ointments (Alves 2011; Jeffrey 2002; Stevinson 2003) or by not informing participants of the treatments offered to the other group(s) (Powell 2003). Fifteen of the included studies were not able to achieve participant blinding (Bhatia 2000; Bury 1995; Cebesoy 2007; Cook 1995; Fagan 2004; Finsen 1999; Gordon 2010; Hochberg 2001; Huemer 2007; Li 2008; Martins 2006; Pomerance 2007; Provinciali 2000; Ritting 2012; Williams 2008) and were rated as having 'high risk of bias'. However, due to the nature of these interventions (for example, wrist orthosis versus no orthosis), it is not surprising that blinding could not be achieved.

Blinding of the outcomes assessors was achieved in nine of the included studies (Janssen 2009; Jeffrey 2002; Martins 2006; Pomerance 2007; Powell 2003; Provinciali 2000; Ritting 2012; Stevinson 2003; Williams 2008). Blinding of the outcome assessors was unclear in eight studies (Bhatia 2000; Bury 1995; Cook 1995; Fagan 2004; Finsen 1999; Gordon 2010; Huemer 2007; Li 2008). In these instances, an explicit statement regarding assessor blinding was not reported in the trial description and attempts to clarify this issue with the trial authors were unsuccessful. Blinding of the outcome assessors was not adequate in three studies and hence rated as 'high risk of bias' (Alves 2011; Cebesoy 2007; Hochberg 2001).

Incomplete outcome data

Fourteen studies were rated as being at 'low risk of bias' for completeness of outcome data at less than three months (Alves 2011; Cebesoy 2007; Fagan 2004; Gordon 2010; Hochberg 2001; Huemer 2007; Janssen 2009; Jeffrey 2002; Li 2008; Martins 2006; Pomerance 2007; Powell 2003; Stevinson 2003; Williams 2008). Of these trials, the percentage lost to follow-up ranged up to 33% (Hochberg 2001) of randomised participants. Three studies were rated as being unclear in this domain (Bhatia 2000; Cook 1995; Provinciali 2000), and two studies were rated as at 'high risk of bias' in this domain (Finsen 1999; Ritting 2012). One trial (Bury 1995) did not evaluate any outcome measures in the time frame less than three months. Complete follow-up of the data-set was achieved in five of the included trials (Alves 2011; Cook 1995; Finsen 1999; Huemer 2007; Provinciali 2000).

Three studies were rated as being at 'low risk of bias' for completeness of outcome data at three months or longer (Alves 2011; Gordon 2010; Pomerance 2007). Two studies were rated as being unclear in this domain (Bury 1995; Cook 1995), and four were rated as having 'high risk of bias' (Bhatia 2000; Finsen 1999; Li 2008; Stevinson 2003) at one or both timepoints. Eleven studies did not evaluate any outcome measures at three months or longer (Cebesoy 2007; Fagan 2004; Hochberg 2001; Huemer 2007; Janssen 2009; Jeffrey 2002; Martins 2006; Powell 2003; Provinciali 2000; Ritting 2012; Williams 2008).

Selective reporting

Twelve studies (Alves 2011; Bhatia 2000; Cebesoy 2007; Hochberg 2001; Janssen 2009; Jeffrey 2002; Li 2008; Martins 2006; Powell 2003; Ritting 2012; Stevinson 2003; Williams 2008) were rated as being at 'low risk of bias' for selective reporting. Eight (Bury 1995; Cook 1995; Fagan 2004; Finsen 1999; Gordon 2010; Huemer 2007; Pomerance 2007; Provinciali 2000) were rated as being at 'high risk of bias' for selective outcome reporting as they either did not specify the results for some of the outcomes listed in the methods section, only partially reported the results or provided them in a format that was not suitable for meta-analysis.

Other potential sources of bias

All studies were judged as being at 'low risk of bias' for this domain, except Stevinson 2003. This study was judged as being unclear in this domain as it was not clearly reported whether the protocol violations significantly influenced the data obtained. Attempts to clarify the data from the trial authors were unsuccessful.

Effects of interventions

Low-level laser therapy (single intervention) versus "sham" therapy (placebo)

One trial, Alves 2011 examined the benefit of low-level laser therapy following CTR compared with a placebo intervention, in 58 participants. Low-level laser therapy was applied using an aluminium gallium Ibramed laser pen with a 830 nm wavelength and 30 mW power. Treatments were delivered in five daily consecutive sessions, with a rest (no treatment) interval of two days, followed by another five consecutive days of treatment. Laser was delivered with a total of 3 Joules, at three points of the carpal tunnel (pisiform, middle of the carpal tunnel and the distal limit of the carpal tunnel). Outcomes were assessed at two weeks, one, two, three, and six months or until discharge (mean 3.6 months both groups). Outcomes included: iatrogenic pain following surgery (pillar pain or palmar pain); iatrogenic scar discomfort; paraesthesia or numbness; other clinical signs of CTS (numbness, nocturnal pain, paraesthesia, pain or positive Tinel's sign); and time to return to activities of daily living (ADL) and work.

Primary outcomes

The primary outcome measures were:

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer

- Alves 2011 did not assess function on a continuous scale and hence no data could be entered into RevMan. However, the trialists reported that all participants in both groups returned to normal ADL.

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months

- Not reported in Alves 2011.

2. Change in CTS symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)

- Symptoms including pain, paraesthesia, numbness and clinical signs (Durkan's test, Tinel's sign, Phalen's test) of CTS were reported as dichotomous outcomes at one, two, three, and six months (or on discharge). Average time to discharge for both groups was 3.6 months (intervention group range: one to six months; placebo group range: one to eight months). Results were reported as dichotomous outcomes, analysed in RevMan as RRs (Analysis 1.1; Analysis 1.2; Analysis 1.3; Analysis 1.4; Analysis 1.5).
- There were no statistically significant differences between participants who received low-level laser therapy and the placebo group in numbness or palmar pain at one, two and three months post surgery. Clinical signs in low-level laser and placebo groups at one and two months post surgery were statistically similar (there were no clinical signs in either group at three months) and no nighttime pain in either group at one, two or three months (Analysis 1.2; Analysis 1.3; Analysis 1.4; Analysis 1.5).
- Results indicated no statistically significant difference in numbness and paraesthesia at six months post surgery in participants who received low-level laser therapy versus placebo (Analysis 1.3; Analysis 1.4). None of the participants in either group displayed clinical signs (Durkan's test, Tinel's sign, Phalen's sign), or nighttime pain at six months post operation (Analysis 1.5).

3. Change in CTS related impairment measures (for example, grip and pinch strength)

- Not reported

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring or pillar pain)

- Presence of scar pain and pillar pain were reported as dichotomous outcomes (present versus not present) at one, two, three and six months or until participants were discharged. Results indicated that there was no statistical difference between the low level laser therapy group and the placebo group in scar pain and pillar pain at one, two, three and six months post surgery (Analysis 1.6; Analysis 1.7).

5. Return to work or occupation (measured as "yes or no") at three months

- All participants (n = 58) in both groups returned to normal occupations within three months (Analysis 1.8).

6. Change in neurophysiologic parameters (using nerve conduction studies)

- Nerve conduction studies were not performed in this study.

7. Presence of adverse events as a result of the rehabilitation

- No participants required a re-operation as a result of the treatment (Analysis 1.9).

Immobilisation (single intervention) versus bulky dressing (single intervention)

Two randomised trials (Bhatia 2000; Bury 1995) were identified. These trials evaluated the effects of immobilisation using a wrist orthosis compared with bulky dressings allowing limited wrist mobility. However, the duration of the treatment and the outcomes measured were too clinically heterogeneous to pool results.

Bhatia 2000 allocated 130 participants to plaster of Paris splint compared with a bulky dressing applied immediately and worn for 48 hours post surgery. Outcomes assessed were number of pain relief tablets (co-proxamol) taken, and pain intensity measured twice per day for 72 hours post surgery. The trial authors did not report whether any of the participants had bilateral CTR and hence the exact number of wrists included is unknown.

Bury 1995 investigated whether bulky dressing plus wrist orthosis or a bulky wool and crepe dressing alone worn for two weeks post surgery had better outcomes at final follow-up (range 3.8 to 7.8 months). Outcomes assessed were patient-reported outcome, patient-reported satisfaction, frequency of residual or recurrent symptoms and complications, digital and wrist range of motion, grip and pinch strength, and thenar muscle function. Results for some of these outcomes were not reported in the publication and attempts to obtain these data from the trial authors were unsuccessful. Forty-seven participants were randomised and 40 participants (43 wrists) were included for analysis.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer

- Not reported

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months

- Not reported

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)

- Pain was measured in Bhatia 2000 using a visual analogue scale (VAS) twice daily for 72 hours after surgery. No numerical data suitable for entry into RevMan 5 were provided. Using the Mann-Whitney U test, the authors reported that there was no statistically significant difference in VAS pain scores between participants wearing a wrist orthosis and those wearing a bulky dressing at two weeks of follow-up.
- Bury 1995 reported the number of participants who were 'symptom-free' and the number 'improved' or 'cured' versus worse or unchanged. Results were dichotomous and analysed in RevMan as RRs (Analysis 2.1; Analysis 2.2). Bury 1995 found no statistically significant benefit from two weeks of immobilisation in a wrist orthosis over a bulky dressing in terms of being symptom free, or being 'improved' or 'cured' rather than 'unchanged' or 'worse' at final follow-up (mean of six months postoperatively) (Analysis 2.1; Analysis 2.2).

3. Change in CTS related impairment measures (for example, grip and pinch strength)

- Reported in Bury 1995 but not measured in Bhatia 2000.
- Bury 1995 measured grip strength (kg) and lateral pinch strength (kg) at a mean of six months' follow-up, but reported only mean values with no measure of variability; there was no statistically significant difference between groups in either measure.

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring or pillar pain)

- Not reported

5. Return to work or occupation ("yes" or "no") at three months

- Reported in Bury 1995 but not measured in Bhatia 2000.
- In Bury 1995, seven (27%) participants in the splinted group and two (12%) in the bulky dressing group did not return to work at final follow-up (average 5.7 months); the difference was not statistically significant (Analysis 2.3).

6. Change in neurophysiologic parameters (using nerve conduction studies)

- Not reported

7. Presence of adverse events as a results of the rehabilitation

- Reported in Bury 1995 but not measured in Bhatia 2000.
- In Bury 1995, the wrist orthosis group reported no adverse effects, whereas one participant in the bulky dressing group had persistent symptoms and underwent revision surgery; this difference between groups was not statistically significant (Analysis 2.4).

Immobilisation (single intervention) versus mobilisation (multiple interventions)

Four trials investigated immobilisation versus mobilisation (Cebesoy 2007; Cook 1995; Finsen 1999; Martins 2006). One quasi-randomised trial (Cebesoy 2007) investigated immobilisation (using a plaster wrist orthosis worn until suture removal) and late mobilisation (bulky dressing worn for a three-week period and immediate early mobilisation exercises). Cook 1995 randomly allocated participants to immobilisation using a volar wrist orthosis for two weeks versus bulky dressing and advice to move the hand and wrist with no restrictions. One quasi-randomised trial (Finsen 1999) compared the use of a plaster wrist orthosis for two weeks

versus light dressing and active mobilisation within comfort from 48 hours post surgery. Martins 2006 investigated the efficacy of immobilisation using a neutral wrist orthosis for two weeks post surgery versus no orthosis and unrestricted movement of the wrist and fingers.

Cebesoy 2007, Cook 1995, Finsen 1999 and Martins 2006 examined the effects of immobilisation using a wrist orthosis when compared with mobilisation using active movement of the affected limb commenced immediately postoperatively (Cebesoy 2007) or on the first (Cook 1995) or second (Finsen 1999; Martins 2006) postoperative day. The duration of orthotic use between trials was different: Cebesoy 2007 immobilised the wrists for ten days, Cook 1995 and Martins 2006 immobilised the affected wrists for two weeks, whilst another trial (Finsen 1999) immobilised the affected wrists for four weeks. However, in Finsen 1999 the trialists reported six deviations from protocol in which people were splinted for either a shorter or longer time.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer

- Reported in Cebesoy 2007
- Function was assessed using the Functional Severity Scale on the BCTQ preoperatively and three months post surgery in Cebesoy 2007. There was no statistically significant difference in function between participants receiving bulky dressing and early mobilisation compared to those receiving splint and late mobilisation at three months post surgery (Analysis 3.1).

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months

- Reported in Cebesoy 2007 and Cook 1995.
- At one month post surgery in Cebesoy 2007, there was no statistically significant difference in improvement in function (using the BCTQ Functional Severity Scale) between participants receiving bulky dressing and early mobilisation and those receiving orthosis and late mobilisation (Analysis 3.2).

- Cook 1995 included the time that participants reported return to normal functional activities of daily living on a continuous scale (from date of surgery to date of activity resumption). No measures of variability were reported so data could not be entered into RevMan for analysis. However, using a two sample t-test, the trialists reported that the dressing plus early mobilisation group had a more rapid return to activities (mean six days in the non-splinted group versus 12 days in the splinted group; P = 0.0004).

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)

- Reported in Cebesoy 2007, Cook 1995, Finsen 1999 and Martins 2006.

CTS symptom severity

- In Cebesoy 2007, symptoms of CTS were assessed using the BCTQ Symptom Severity Scale preoperatively, and at one and three months post surgery. There was no statistically significant difference in symptom scores between splint and late mobilisation groups at one or three months (Analysis 3.3).
- In Martins 2006, change on the BCTQ Symptom Severity Scale and Symptom Intensity Score were measured at the end of two weeks' treatment, and were reported as end point mean ± standard deviation (SD) scores and as index mean ± SD scores (calculated as pre-operative value - postoperative value / pre-operative value). At the end of two weeks' treatment, no statistically significant difference was found on the BCTQ Symptom Severity Score or the Symptom Intensity Score. Nor was there a statistically significant difference at two weeks in change from pre-operative scores for the Symptom Severity Score or Symptom Intensity Score (Analysis 3.3, Analysis 3.4;Analysis 3.5).

CTS pain severity using a VAS

- Cook 1995 assessed pain severity using a VAS (1 to 10) at the end of two weeks of treatment, and at both two and 10 weeks after cessation of treatment. However, the trial authors reported no measures of variability, which precluded entry of data into RevMan. According to the authors, using an independent samples t-test, "Average subjective pain rating on a ten point scale was significantly better for the unsplinted patients 14 days after surgery (0.9 for unsplinted vs 2.4 for splinted, P = 0.001) and 1 month after surgery (0.5 for unsplinted vs 1.5 for splinted, P=0.01). Subjective rating and pain rating did not differ between the two groups 3 and 6 months after surgery."
- CTS pain severity (0 to 100 scale) was also assessed in Finsen 1999 at two and six weeks and six months post surgery. However, the authors reported median values and CIs that were reflective of skewed data (hence not appropriate for inclusion in a standard meta-analysis). According to the authors, based on results from non-parametric statistical tests, the VAS pain values were not significantly different between the immobilised and mobilised groups at any time point post surgery.

3. Change in CTS related impairment measures (for example, grip and pinch strength)

- Reported in Cook 1995 and Finsen 1999
- Grip strength and key pinch strength were measured in Cook 1995 at the end of two weeks of treatment, and at two and 10 weeks after treatment ceased. Measures of variability (for example, SDs) were not reported by the authors, and attempts to obtain them were unsuccessful. According to the authors, based on an independent samples t-test, "Grip strength was slightly greater in unsplinted patients at 14 days after surgery (15 kg in unsplinted vs 10 kg in splinted, P = 0.003) and at 1 month (18

kg in unsplinted vs 14 kg in splinted, P = 0.02). By 3 months grip strength was equivalent in the two groups. Similarly, key pinch strength recovered more rapidly in the unsplinted hands at 14 days (6 kg vs 4 kg, p = 0.01) and 1 month (7 kg vs 5 kg, P= 0.01), but did not differ by 3 months".

- Finsen 1999 assessed impairment using measures of grip strength, key pinch strength, and pinch strength between the thumb and fourth and fifth fingers (4/5-pinch). However, median values and 95% CIs were reported and attempts to obtain data suitable for inclusion in RevMan 5 were unsuccessful. Based on non-parametric tests, the authors reported that "There was a considerable loss of strength in the operated hand, compared to preoperative values at 6 weeks for all three parameters. The reductions in grip and key pinch strength were almost identical in the two treatment groups" and "4/5 pinch strength was also significantly reduced in both groups at 6 weeks."

- Impairment was assessed using grip strength and key pinch strength in Cook 1995 at six months after treatment cessation. No numerical data were reported by the authors, and attempts to obtain these data were unsuccessful. By applying an two samples t-test, the only information on these outcomes reported by the authors was that "...by 6 months grip strength in both groups slightly exceeded preoperative grip strength....".
- Grip strength, key pinch strength, and pinch strength between the thumb and fourth and fifth fingers (4/5-pinch) was also measured in Finsen 1999 at six months post surgery, but the data reported were not in a format suitable for entry into RevMan 5. According to the authors, "At 6 months, the grip strength had returned to preoperative values in both groups and the key pinch strength had improved considerably. Again, the values in the two groups were almost the same...It [4/5 pinch strength] had improved after 6 months, but was still around 20% lower than preoperatively. Patients in the immobilised group were slightly weaker than the others, but the difference was not statistically significant."

- Two-point discrimination and touch sensation determined by Semmes-Weinstein monofilaments was measured in Cook 1995 at the end of two weeks of treatment, and at two and 10 weeks after treatment ceased. Measures of variability were not reported by the authors, and attempts to obtain data were unsuccessful. According to the authors, based on an independent samples t-test, "Improvement in two-point discrimination and sensibility measured using Semmes-Weinstein monofilaments was similar in the two groups of patients. "At the end of two weeks of treatment, touch sensation was measured using two-point discrimination in Martins 2006. There was a significant difference between the end point scores of the immobilisation and mobilisation groups. However, the difference between the change scores at two weeks post operation was not statistically significant (Analysis 3.6;Analysis 3.7).

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring or pillar pain)

- Reported in Cook 1995, Finsen 1999 and Martins 2006.
- Finsen 1999, Cook 1995 and Martins 2006 reported the presence of iatrogenic complications as a result of the CTR surgery. Cook 1995 reported that no wound complications or bowstringing of tendons were observed in either group. Further, there was no statistically significant difference between the orthosis and mobilisation (using range-of-motion exercises) groups in the incidence of scar tenderness or pillar pain at one month. No statistically significant difference was found in Finsen 1999 between the wrist immobilisation and mobilisation groups in frequency of scar discomfort pain, hypothenar pain or thenar pain at six weeks and at six months. Martins 2006 reported that no median nerve lesion, wound dehiscence or tendon injuries were experienced in either group. For all analyses, see Analysis 3.8.

5. Return to work or occupation (measured as 'yes' or 'no') at three months

- Reported in Cook 1995 and Finsen 1999.
- Cook 1995 reported the mean number of days until return to activities of daily living, to light duty work, and to full duty work. However, no measures of variability were reported. Using an independent samples t-test, the authors reported that "Unsplinted patients had a more rapid return to activities of daily living (average six days in unsplinted, 12 days in splinted, P=0.0004); more rapid return to light duty work (15 days in unsplinted, 24 days in splinted, P=0.01); and more rapid return to full duty work (17 days in unsplinted, 27 days in splinted, P= 0.005)."
- Finsen 1999 reported the number of weeks sicklisted by participants in each group who had been gainfully employed before CTR. The authors reported median values and CIs that were reflective of skewed data (not appropriate for inclusion in a standard meta-analysis). The gainfully employed participants in both the mobilisation group and the immobilised group were sicklisted for a median of six weeks postoperatively (95% CI 5 to 6 weeks and 4 to 7 weeks, respectively).

6. Change in neurophysiologic parameters (using nerve conduction studies)

- Not reported

7. Presence of adverse events as a results of the rehabilitation

- In Cebesoy 2007, 16 of 20 participants (80%) in the splinted group reported a heavy feeling and discomfort caused by the intervention, whereas none of the participants in the bulky dressing group reported this problem (Analysis 3.9). No flexor bowstringing was reported in either group.
- Cook 1995, Finsen 1999 and Martins 2006 reported complications (iatrogenic symptoms) as a result of the carpal tunnel surgery rather than complications as a result of the rehabilitation intervention.

Elevation (single intervention) versus standard care (control)

Fagan 2004 examined the benefit of elevation using a home elevation device with a Bradford sling suspended vertically at night and a crepe sling when ambulant for five days post surgery, compared with a control group (standard care), in 43 participants. Outcomes included hand volume using a volume displacement apparatus (assessed pre-operatively and at five days post surgery), pain (assessed once a day for five days post surgery) and analgesic usage each day (for five days).

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer
- Not reported

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months
- Pain was assessed using a VAS (0 to 10 scale) at five days post surgery. There was no statistically significant difference in this outcome between participants using a home elevation device and Bradford sling and those receiving standard care (Analysis 4.1).

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)
- Not reported

3. Change in CTS related impairment measures (for example, grip and pinch strength)
- Not reported

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring and pillar pain)
- Swelling (volume) was assessed pre-operatively and at five days post surgery using a volume displacement apparatus. There was no statistically significant difference in swelling between the home elevation device and standard care (Analysis 4.2).

5. Return to work or occupation (measured as 'yes' or 'no') at three months
- Not reported

6. Short-term (less than three months) and long-term (three months or more) change in neurophysiologic parameters (using nerve conduction studies)
- Not reported

7. Presence of adverse events as a results of the rehabilitation at short-term (less than three months) and long-term (three months or more) follow-up
- Not reported

Electrical stimulation (single intervention) versus no treatment (control)

A trial by Gordon 2010 compared the use of electrical stimulation of the median nerve 30 minutes after CTR for one hour with a no treatment control group. Twenty-five participants (25 wrists) were allocated to either the intervention or control group. Outcomes included results of nerve conduction studies, BCTQ (Symptom Severity Score and Functional Status Scores) and hand touch sensation using Semmes-Weinstein monofilaments. They were assessed twice pre-operatively, and at three, six to eight and 12 months post surgery.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or greater
- In Gordon 2010, the BCTQ Functional Status Score was used to measure functional ability at three, six to eight, and 12 months post-surgery. Statistics were reported graphically, and attempts to obtain numerical data from the trial authors were unsuccessful.

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months
- Not reported

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)
- BCTQ (Symptom Severity Score) was used to measure functional ability at three, six to eight, and 12 months post surgery. Statistics were reported graphically, and attempts to obtain numerical data from the trial authors were unsuccessful.

3. Change in CTS related impairment measures (for example, grip and pinch strength)
- Impairment in touch sensation was measured using Semmes Weinstien Monofilaments at three, six to eight, and 12 months post-surgery. Statistics were reported graphically and attempts to obtain numerical data from the trial authors were unsuccessful.

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring and pillar pain)
- Not reported

5. Return to work or occupation (measured as 'yes' or 'no') at 3 months
- Not reported

6. Change in neurophysiologic parameters (using nerve conduction studies)
- Nerve conduction (using motor terminal latency and sensory terminal latency) was measured at baseline (pre-operatively) and at three months post surgery. The authors stated

that, "the latency did not change significantly in the control group in the postoperative period, while in contrast, significant acceleration in the motor latency occurred early in the stimulation group at 3 months. Motor latencies from 3 months onwards were the same as that for the healthy subjects. Simlarly, early recovery of conduction velocity of the sensory nerve fibres was found in the stimulation group at 3 months when amplitude of the SNAP had not yet changed significantly from pre-operative values. In contrast recovery was delayed in the control patient group."

7. Presence of adverse events as a results of the rehabilitation
- Not reported.

Controlled cold therapy and narcotic use (multiple interventions) versus ice therapy plus narcotic use (multiple interventions)

One randomised trial (Hochberg 2001) was identified. It compared controlled cold therapy (plus narcotic usage) with ice therapy (plus narcotic usage). Controlled cold therapy was applied using a thermostatically controlled cooling blanket maintained at 7.2°C continuously for 12 hours per day for three days post surgery. Ice therapy was applied using a commercially available ice pack applied immediately after surgery and on return home use of a ice bag (ice cubes in a plastic bag) for 12 hours per day for three days post surgery. Participants in both groups were provided with 28 combined hydrocodone and paracetamol pain relief tablets. Seventy-two participants (72 wrists) were randomly allocated to either of the intervention groups. Outcomes were measured pre-operatively, immediately post surgery and three days post surgery, and included swelling measured at the wrist by circumference and pain intensity.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer
- Not reported

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months
- Not reported.

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)
- Intensity of pain severity (measured using a 0 to 10 VAS) was measured before CTR and at the end of three days' treatment. End point and change scores were reported based on a per protocol analysis and an intention-to-treat analysis. At the end of three days' treatment, participants receiving controlled cold therapy were found to have statistically significantly less pain than those receiving ice therapy as based on a per protocol analysis (MD -2.80; 95% CI -4.50 to -1.10) and an intention-to-treat analysis (MD -1.90; 95% CI -3.51 to -0.29). However, while the controlled cold therapy group had a statistically significantly greater reduction in pain from baseline to day three on a per protocol analysis (MD -2.80; 95% CI -4.88 to -0.72), no statistically significant change in pain between groups was found using an intention-to-treat analysis (MD -1.40; 95% CI -3.24 to 0.44) (Analysis 5.1).

3. Change in CTS related impairment measures (for example, grip and pinch strength)
- Not reported.

4. Presence of iatrogenic symptoms secondary to CTR surgery (for example, swelling, scar pain, excessive scarring, and pillar pain)
- Swelling was recorded using wrist circumference measurements immediately postoperatively and at three days post surgery. Both endpoint and change scores were reported based on a per protocol analysis and an intention-to-treat analysis. At the end of three days' treatment, there was no statistically significant difference in the amount of swelling (endpoint score) between controlled cold therapy and ice therapy groups based on per protocol analysis or intention-to-treat analysis. However, when measured as change scores, the controlled cold therapy group had a statistically significant greater reduction from baseline to day three compared to ice therapy, on per protocol (MD -1.00; 95% CI -1.26 to -0.74) and intention-to-treat analyses (MD -1.10; 95% CI -1.33 to -0.87) (Analysis 5.2).
- We have assumed that the mean change from baseline to day three in oedema (wrist circumference) in the "ice therapy group" was incorrectly reported by the trial authors. In both cases the value reported is -0.7, but the end point scores suggest that these values should be +0.7, as wrist circumference increased in the ice therapy group. Further, the authors report that: "At 3 days, of the 24 CCT [controlled cold therapy] patients, 19 showed reduction in mean wrist circumference from baseline, three showed no change and two showed an increase. In contrast, all patients in the ice therapy group showed an increase in mean wrist circumference at 3 days. When all patients for whom edema scores were available were included in an intention-to-treat analysis, the CCT group again showed a statistically significant greater reduction in wrist circumference from baseline and significantly greater mean percentage reduction in wrist circumference than the ice-therapy group." Attempts to contact the authors to confirm this have been unsuccessful.

5. Return to work or occupation (measured as 'yes' or 'no') at three months
- Not reported.

6. Change in neurophysiologic parameters (using nerve conduction studies)
- Not reported.

7. Presence of adverse events as a results of the rehabilitation
- Not reported.

Bulky dressing and splint (single intervention) versus light dressing (single intervention)

One trial by Huemer 2007 allocated 50 participants (50 wrists) to either a bulky dressing with a volar wrist orthosis in a neutral position for 48 hours post surgery or a light bandage dressing worn for 48 hours post surgery. Outcomes were measured pre-operatively and at three months post surgery and included: pain intensity, two-point discrimination, grip strength, results of nerve conduction studies and scar tenderness.

Primary outcome

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer
- Not reported.

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months
- Not reported.

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)
- Pain (VAS 0 to 10) was assessed in Huemer 2007 at the end of two days treatment; however, no measure of variability was reported, so data could not be entered into RevMan. No statistically significant difference between participants wearing a wrist splint and those wearing a light dressing for 48 hours post CTR was reported.

3. Change in CTS related impairment measures (for example, grip and pinch strength)
- In Huemer 2007, CTS related impairment was assessed using measures of grip strength (kg) at three months post surgery. Only mean values were reported (no measures of variability available).The authors reported no statistically significant difference.
- Two-point discrimination was used to measure hand numbness. However, no measurement of variability was reported so data could not be entered into RevMan.

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring, and pillar pain)
- Participants in Huemer 2007 were asked to report whether they had no perceptible scar pain, scar pain with pressure or scar pain at rest at three months of follow-up. There was no statistically significant difference between immobilisation and light dressing groups in the number of participants who reported having no perceptible scar pain at three months (Analysis 6.1).

5. Return to work or occupation (measured as 'yes' or 'no') at three months
- Not reported.

6. Change in neurophysiologic parameters (using nerve conduction studies)
- Distal motor latency (msec) was reported in Huemer 2007 as mean improvement from baseline to three months of follow-up. However, only mean values were given, so no data could be entered into RevMan 5.1. The authors reported no statistically significant difference between the splint and light dressing groups.

7. Presence of adverse events as a result of the rehabilitation
- Huemer 2007 reported that there were no median nerve, digital nerve, vascular, or tendon complications in either group, and delayed wound healing was not observed.

Contrast baths plus exercise (multiple interventions) versus contrast baths (single intervention) versus exercise (single intervention)

One randomised trial (Janssen 2009) allocated 58 participants to either contrast baths alone or contrast baths plus exercise or exercise only for the treatment of postoperative oedema in the immediate period following CTR. Outcomes were measured immediately after treatment delivered 10 to 14 days post surgery, and included hand volume using the water displacement method.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer
- Not reported.

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months
- Not reported.

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)
- Not reported.

3. Change in CTS related impairment measures (for example, grip and pinch strength)
- Not reported.

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring, and pillar pain)
- Oedema (measured as the change in hand volume in mL) was measured before and after the intervention at 10 to 14 days post surgery. Janssen 2009 found no statistically significant difference in swelling between participants receiving contrast

baths plus exercises and those receiving contrast baths alone. There was more swelling with contrast baths plus exercises than with exercises alone (MD 23.20; 95% CI 3.60 to 42.80) and more swelling with contrast baths alone than with exercises alone (MD 32.00; 95% CI 12.61 to 51.39) (Analysis 7.1; Analysis 8.1; Analysis 9.1).

5. Return to work or occupation (measured as 'yes' or 'no') at three months
- Not reported.

6. Change in neurophysiologic parameters (using nerve conduction studies)
- Not reported.

7. Presence of adverse events as a results of the rehabilitation
- Not reported.

Arnica (single intervention) versus "sham" therapy (placebo)

One randomised trial (Jeffrey 2002) examined the efficacy of arnica D6 tablets and ointment used postoperatively for swelling and bruising. Forty participants (80 wrists) were allocated to either the intervention group or a placebo group. They were advised to take the tablets three times daily for two weeks and commence massage of the ointments around the wound at 72 hours post surgery until two weeks post surgery. Outcomes were measured pre-operatively and at one and two weeks post surgery. Outcomes included grip strength, wrist circumference, pain intensity, and adverse events such as allergy or infection.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer
- Not reported.

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than 3 months
- Not reported.

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)
- Pain intensity during the postoperative period was measured using a VAS (which was converted into a 0 to 10 scale) at the end of one and two weeks' treatment. However, only the mean values were reported numerically (SDs were presented graphically, but could not be extracted using Microsoft Paint). Using Student's t-test or the Mann-Whitney U test, the authors reported that "At 1 week, the Arnica group had a mean hand-discomfort score of 2.6 compared to 3.5 for the placebo group; this was not significantly different. At 2 weeks, the Arnica group had a mean hand-discomfort score of 1.3 compared to 2.5 for the placebo group, which was statistically significant (P<0.03)."

3. Change in CTS related impairment measures (for example, grip and pinch strength)
- Grip strength (kg) was measured in Jeffrey 2002. No statistically significant difference in percentage change from preoperative values was found between participants receiving arnica D6 tablets and ointment and those receiving placebo at the end of one and two weeks of treatment (Analysis 10.1).

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring, and pillar pain)
- Jeffrey 2002 found no statistically significant difference between arnica D6 tablets and ointment and placebo in terms of percentage change from pre-operative value in hand swelling (wrist circumference) at the end of one week and two weeks' of treatment (Analysis 10.2).

5. Return to work or occupation (measured as 'yes' or 'no') at three months
- Not reported.

6. Change in neurophysiologic parameters (using nerve conduction studies)
- Not reported.

7. Presence of adverse events as a results of the rehabilitation
- In Jeffrey 2002, no adverse effects (such as allergy or infection) were reported in the arnica or placebo groups.

High dose arnica (single intervention) versus low dose arnica (single intervention) versus "sham" therapy (placebo)

Stevinson 2003 randomly allocated 64 participants to either high dose (30C) arnica tablets or low dose (6C) arnica tablets or placebo. Arnica was taken three times per day for seven days pre-operatively and 14 days postoperatively. The placebo tablets were identical in appearance to the arnica tablets. Outcomes included pain using the short-form McGill Pain Questionnaire (MPQ), bruising measurement using colour analysis from a photograph of the participants' hands, clinician-rated bruising, swelling measured by wrist circumference, use of analgesic medication, and adverse events.

Primary outcomes

1. Change in self reported functional ability as measured on a continuous scale at three months or longer
- Not reported.

Secondary outcomes

1. Change in self reported functional ability as measured on a continuous scale at less than three months

- Not reported.

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)

- Pain was assessed using the MPQ (0 to 100 VAS) and by asking participants to rate whether they experience different pain descriptor words such as 'stabbing, 'gnawing' and 'shooting'. However, the data for these continuous measures could not be entered into RevMan 5 as only median (range) values were reported. Using Chi^2 tests, the authors only reported that "Postoperative pain did not differ between the groups at day 4 according to VAS scores..." . It was also reported that "The only group difference that approached statistical significance was on the MPQ descriptors total score (Chi^2=6.72, d.f. = 2, P = 0.04) where the placebo group had lower scores than the arnica 30C group at day nine (U = 122.0, P = 0.01, Mann-Whitney U test)."

3. Short-term (less than three months) and long-term (three months or more) change in CTS related impairment measures (for example, grip and pinch strength)

- Not reported.

4. Presence of iatrogenic symptoms secondary to CTR surgery (for example, swelling, scar pain, excessive scarring and pillar pain)

- Stevinson 2003 reported the number of participants who were rated by a clinician as having no, mild to moderate, or severe bruising after 4, 9 and 14 days treatment. We dichotomised participants into those who were rated as having 'no bruising' and those who were rated as having mild to moderate or severe bruising. There was no statistically significant difference in the number of participants rated as having no bruising between arnica 30C and placebo, arnica 6C and placebo or between the two doses of arnica, at any of the three time points (Analysis 11.1; Analysis 12.1;Analysis 13.1). Stevinson 2003 also assessed the extent of bruising (by taking a photograph of participants' wrists and analysing the blue and red channel brightness). Similarly, bruising did not differ between the groups at day four in terms of blue or red channel brightness.

5. Return to work or occupation (measured as 'yes' or 'no') at three months

- Not reported.

6. Change in neurophysiologic parameters (using nerve conduction studies)

- Not reported.

7. Presence of adverse events as a results of the rehabilitation

- In Stevinson 2003, eight participants reported adverse effects: three in the placebo group (heartburn; sore throat and flu-like symptoms; faintness and headache), three in the arnica 30C group (dry mouth; headache; feeling 'throbby' in head/neck), and two in the arnica 6C group (drowsiness; sore tongue). The differences between groups (arnica 30C versus placebo, arnica 6C versus placebo and arnica 30C versus arnica 6C) were not statistically significant (Analysis 11.2; Analysis 12.2; Analysis 13.2).

Electrical stimulation versus decimer wave therapy versus combined therapy versus control

The study conducted by Li 2008 involved three different treatment groups and a no-treatment control group to examine the benefit of decimeter wave therapy and electrical stimulation on recovery of nerve function following peripheral nerve entrapment surgery. Each treatment group was treated for 20 days, followed by a 10 day break, for three months. The first intervention group was given once daily electrical stimulation, six min per session and the second group, daily decimeter wave therapy using a mild-hot therapeutic instrument applied in the early stages at 10 to 15 W for 10 min per session, increased to 10 to 30 W in the middle-late phase of treatment for 20 min per session. The third group received compound physical factor treatment (electrical stimulation and decimeter wave therapy combined). A total of 124 participants with peripheral nerve entrapment were allocated to the four groups; 75 of them had CTS. Trial authors did not report CTS specific data and attempts to obtain this information were unsuccessful. Therefore, we were unable to analyse outcome data in this review.

Multimodal hand therapy (multiple interventions) versus no formal therapy (control)

Pomerance 2007 examined the effects of a formal program of multimodal hand therapy (consisting of six 30 min sessions of nerve gliding, range of motion and strengthening and additional treatments, for example, massage, fluidotherapy with a qualified hand therapist). Treatments were provided over a two-week period starting at five to seven days post surgery. The control group received advice regarding tendon gliding exercises and scar massage prior to surgery but no formal therapy after surgery. A total of 150 participants were randomised. Outcomes included time to return to work, pain intensity, lateral pinch strength, grip strength, function using the DASH questionnaire, persistence of symptoms, wound dehiscence, and an economic evaluation of the intervention.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer

- DASH was measured at five and a half months post-treatment (six months post surgery). There was no statistically significant difference between treatments (Analysis 14.1).

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months

- Not reported.

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)

- Change in CTS clinical symptoms was measured in Pomerance 2007 using a VAS (0 to 10) to assess CTS pain at the end of two weeks of treatment, and at two, four, and 10 weeks and five and a half months after treatment ended (two, four, six, and 12 weeks and six months post surgery). However, no numerical data were reported for this outcome, and the authors only reported that by applying Student's t-test, no statistically significant difference was found in pain complaints at any time point post surgery between the multimodal hand therapy and the no therapy groups.

3. Change in CTS related impairment measures (for example, grip and pinch strength)

- Grip strength (kg) and lateral pinch strength (kg) were measured in Pomerance 2007. The change in grip strength was not statistically significantly different in the multimodal hand therapy group compared to controls at any time point (Analysis 14.2). Nor was multimodal hand therapy found to improve lateral pinch strength compared to controls (Analysis 14.3).

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring, and pillar pain)

- Not reported.

5. Return to work or occupation (measured as 'yes' or 'no') at three months

- The number of participants in each group who returned to regular-duty work at certain time points was recorded by Pomerance 2007. Data were reported separately for cases with Medicare insurance, commercial insurance, or workers' compensation insurance, but these data were combined for entry into RevMan. There was no statistically significant difference between multimodal hand therapy and no formal therapy in terms of the number of participants in each group who had returned to work by two weeks post surgery, but at six weeks post surgery (RR 1.02; 95% CI 0.89 to 1.17), and eight weeks post surgery (RR 1.04; 95% CI 0.97 to 1.12) results favoured the therapy group. It was reported that all participants in this trial had returned to regular-duty work by 12 weeks following CTR (Analysis 14.4).

6. Change in neurophysiologic parameters (using nerve conduction studies)

- Not reported.

7. Presence of adverse events as a results of the rehabilitation

- Pomerance 2007 reported that there were three adverse effects throughout the study period: one in the multimodal hand therapy group and two in the no therapy control group, with no statistically significant difference between groups . These participants experienced a wound dehiscence when sutures were removed five days postoperatively (Analysis 14.5).

Desensitisation therapy (as part of multiple interventions) versus standard treatment (control)

The Powell 2003 unpublished study randomly allocated 29 participants to either a graduated desensitisation program for three months or a standard treatment control. Outcomes were measured at three and six weeks, and three months post operation. Outcomes included scar sensitivity using a dolorimeter (pressure gauge), patient-reported scar sensitivity, functional status using the BCTQ Functional Status Scale, and grip strength.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer

- BCTQ Functional Status Scale was used to record functional ability at three months. There was no statistically significant benefit of graded desensitisation over standard treatment (Analysis 15.1)

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months

- BCTQ Functional Status Scale was used to measure self reported functional ability at three and six weeks. No statistically significant difference was found between the intervention and control group at three or six weeks postoperatively (Analysis 15.2).

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)

- Discomfort was measured using a 0 to 100 VAS. No statistically significant difference was found between the intervention and control group at three, six and 12 weeks postoperatively (Analysis 15.3).

3. Change in CTS related impairment measures (for example, grip and pinch strength)

- Impairment was assessed using grip strength. No statistically significant differences were found between groups at three, six and 12 weeks postoperatively (Analysis 15.4).

4. Presence of iatrogenic symptoms secondary to CTR (for example, swelling, scar pain, excessive scarring and pillar pain)

- Iatrogenic symptoms including scar sensitivity using an objective dolorimeter pressure gauge. There were no statistically significant differences found between groups at three, six and 12 weeks postoperatively (Analysis 15.5).

5. Return to work or occupation (measured as 'yes' or 'no') at three months

- Not reported.

6. Change in neurophysiologic parameters (using nerve conduction studies)

- Not reported.

7. Presence of adverse events as a results of the rehabilitation

- No adverse events were recorded in either the intervention of control group with respect to wound dehiscence.

Multimodal therapy (multiple interventions) versus progressive patient-directed home exercise program (single intervention)

Provinciali 2000 examined the benefits of multimodal formal therapy program (10 one-hour sessions of physiotherapy including soft tissue mobilisation, exercises, scar massage, nerve gliding, grip and pinch exercises, motor dexterity exercises, sensory stimulation and sensory re-education by the same physiotherapist), compared with a progressive patient-directed home exercise program. Outcomes included hand dexterity using the nine-hole peg test, hand function using the Jebsen-Taylor test, BCTQ Symptom Severity Scale, and time to return to work for workers' compensation participants. One hundred participants were allocated to each group; however, some participants were reported to have had bilateral surgeries.

Primary outcomes

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer

- Not reported.

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months

- Not reported.

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)

- Symptom severity was assessed in Provinciali 2000 using the Italian version of the BCTQ at the end of two weeks of treatment (one month post surgery) and two months later. The authors only reported the summed scores across participants for items 1 to 10 (with no measures of variability). Therefore, these data could not be entered into RevMan 5 for statistical analysis. Using a Chi^2 test, and applying the Bonferroni correction which resulted in the criterion for statistical significance being set at $P < 0.001$, the authors reported that no significant difference in occurrence of CTS symptoms was found between the multimodal hand therapy group and the home exercises group at either time point.

3. Change in CTS related impairment measures (for example, grip and pinch strength)

- Not reported.

4. Presence of iatrogenic symptoms secondary to CTR surgery (for example, swelling, scar pain, excessive scarring and pillar pain)

- Not reported.

5. Return to work or occupation (measured as 'yes' or 'no') at three months

- Provinciali 2000 measured the mean number of days until participants returned to work. However, workers' compensation cases were excluded, but the report does not state the number excluded for this reason from this outcome analysis or the proportion of participants returning to work in each group. Therefore, these data could not be entered into RevMan for analysis.

6. Change in neurophysiologic parameters (using nerve conduction studies)

- Not reported.

7. Presence of adverse events as a results of the rehabilitation

- Not reported.

Short duration postoperative dressing (single intervention) versus extended duration postoperative dressing (single intervention)

Two trials (Ritting 2012; Williams 2008) investigated the effect of short versus extended duration postoperative dressing. In the study conducted by Ritting 2012, 94 participants were allocated to either a postoperative bulky dressing worn for 48 to 72 hours or for nine to 14 days. Outcomes were measured at two and six to 12 weeks post surgery and included: BCTQ, grip strength, tip pinch strength, three-point pinch strength, lateral pinch strength and wound healing. Williams 2008 compared outcomes between a bulky dressing applied for 24 hours to one applied for two weeks post surgery, in a study that included 100 participants. Outcomes were assessed pre-operatively and at the end of the intervention (two weeks) and included BCTQ and change in iatrogenic symptoms.

1. Long-term change in self reported functional ability as measured on a continuous scale at three months or longer

- Measured in Ritting 2012 but not in Williams 2008.
- Ritting 2012 measured the overall results of the BCTQ (Symptom Severity Score and Functional Status Score reported as a combined score) at six to 12 weeks. As the functional status score was not reported separately, no data could be entered into Revman for this outcome.

Secondary outcomes

1. Short-term change in self reported functional ability as measured on a continuous scale at less than three months
- Measured in Williams 2008 but not in Ritting 2012.
- Williams 2008 analysed BCTQ Functional Status Scores and found no statistically significant difference in the endpoint scores at two weeks), but the change from baseline score favoured the extended duration dressing (MD 0.40; 95% CI 0.05 to 0.75) (Analysis 16.1).
- Ritting 2012 reported an overall BCTQ and Functional Status Score but results were not available for analysis.

2. Change in CTS clinical symptoms as measured on a continuous scale (for example, pain, numbness and paraesthesia)
- Measured in Williams 2008 but not measured in Ritting 2012.
- Williams 2008 analysed the Symptom Severity Scores from the BCTQ and found no statistically significant differences between groups at end point (two weeks). However, a statistically significant difference was found in the change scores (baseline to two weeks) (MD 0.30; 95% CI 0.01 to 0.59) (Analysis 16.2), favouring the extended duration dressing.
- Ritting 2012 reported an overall BCTQ and the results of the Symptom Severity Score subscale were not available for further analysis.

3. Change in CTS related impairment measures (using grip and pinch strength)
- Measured in Ritting 2012 but not in Williams 2008.
- Ritting 2012 examined the differences in grip strength, pinch strength (tip pinch, three-point pinch and lateral pinch) between groups at two weeks and six to 12 weeks post surgery. Grip strength was statistically significantly better in the group who had their postoperative dressing removed earlier (MD -16.00; 95% CI -21.57 to -10.43; Analysis 16.3). There were no statistically significant differences in three-point pinch or lateral pinch but a small statistically significant difference favouring the short dressing group was found for tip pinch (MD -1.20; 95% CI -2.35 to -0.05) (Analysis 16.4).

4. Presence of iatrogenic symptoms secondary to CTR surgery (for example, swelling, scar pain, excessive scarring and pillar pain)
- Measured in both Ritting 2012 and Williams 2008.
- Wound healing using a qualitative assessment describing the status of the wound (pristine, erythema, dehiscence or drainage) was reported in Ritting 2012. There were no complications reported in either group at the final postoperative evaluation in Ritting 2012. One participant in the longer duration dressing had a slight wound dehiscence at the two-week visit which resolved later with wound care. No complications (including infection and wound status) in the two weeks following surgery were reported in either group in Williams 2008.

5. Return to work or occupation (measured as 'yes' or 'no') at three months
- Not reported.

6. Change in neurophysiologic parameters (using nerve conduction studies)
- Not reported.

7. Presence of adverse events as a results of the rehabilitation
- Not reported in Ritting 2012 or Williams 2008.

Complications were reported as iatrogenic symptoms as a result of the surgery rather than the interventions.

Subgroup and sensitivity analyses

We could not perform any subgroup analyses in this review. Clinical heterogeneity of interventions and outcomes or paucity of the specified subgroups being distinguished by trialists meant that these analyses were not possible. Furthermore, sensitivity analyses were not performed as there were no meta-analyses.

DISCUSSION

Summary of main results

The objective of this systematic review was to determine the effectiveness and safety of various rehabilitation treatments to optimise outcomes following CTR, compared with no treatment, a placebo or another nonsurgical intervention. Twenty studies investigating a total of 1445 participants were included. From the included studies, it was determined that there is currently limited and low to very low quality evidence to support the use of a variety of rehabilitation treatments following CTR. The studies were heterogenous in the type of rehabilitation treatments provided, intensity, dosage, duration of the treatment, timing of the treatment, outcome assessments and treatment setting. Therefore, data could not be pooled across studies.

Amongst the quality issues of these studies unit of analysis errors are important. Jeffrey 2002 avoided a unit of analysis error, Finsen 1999 Martins 2006 and Provinciali 2000 committed such errors and this was unclear in Bury 1995, Bhatia 2000 and Li 2008, Therefore, it is important for clinicians and researchers to interpret the results of the studies with caution.

One study compared multiple treatments to a control group (Li 2008); five studies compared one rehabilitation treatment to a no-treatment control group (Fagan 2004; Gordon 2010; Li 2008; Pomerance 2007; Powell 2003); three studies compared one rehabilitation treatment to a placebo (Alves 2011; Jeffrey 2002; Stevinson 2003); 14 studies compared one rehabilitation treatment to other rehabilitation treatments (Bhatia 2000; Bury 1995; Cebesoy 2007; Cook 1995; Finsen 1999; Hochberg 2001;

Huemer 2007; Janssen 2009; Li 2008; Martins 2006; Provinciali 2000; Ritting 2012; Stevinson 2003; Williams 2008).

Only four studies reported the primary outcome of interest, that is long-term self reported functional ability at three or more months (Cebesoy 2007; Gordon 2010; Pomerance 2007; Powell 2003). Only three of these trials (Cebesoy 2007; Pomerance 2007; Powell 2003) reported suitable outcome data for inclusion in this review. One high quality trial (Powell 2003) with a small sample size found no statistically significant effect on BCTQ of a desensitisation program over a standard treatment control group. One moderate quality trial (Pomerance 2007) assessed 150 participants at six months post surgery using the DASH questionnaire and found no statistically significant difference in scores in the no therapy group (instructed pre-operatively on tendon gliding exercises, scar massage and return to activity) compared with a two-week course of multimodal therapy commenced at five to seven days post surgery. However, this study only included employed persons and hence this limits the generalisability to non-employed or retired people. One very low quality quasi-randomised trial (Cebesoy 2007) found that participants who received a bulky dressing and commenced early mobilisation reported no statistically significant difference in function on BCTQ at three months post surgery, compared with participants who received a postoperative wrist orthosis at three months post surgery.

Two low quality trials (Bhatia 2000; Bury 1995) compared immobilisation using a wrist orthosis to a bulky dressing and mobilisation. Both reported incomplete data and limited data on measures of variability. Bury 1995 found that the improvement in CTS symptoms in participants who wore a wrist orthosis for two weeks was not statistically significantly different than the improvement in those who wore a bulky dressing. The lack of participant blinding in this study means that the outcomes should be interpreted with caution, as patients' symptom reporting may have been influenced by knowledge of their intervention group.

Four trials (Cebesoy 2007; Cook 1995; Finsen 1999; Martins 2006) compared immobilisation of the wrist using an orthosis with a program of early mobilisation. Studies by Cook 1995 and Finsen 1999 had incomplete data, which limited analysis and reporting of their results. Measures of variability were also missing for a number of outcome measures in each trial, and some outcomes were reported using median values indicating the data may have been skewed (Finsen 1999). Martins 2006 found no significant differences between the two interventions, which suggests that one intervention is not superior over the other in terms of change in CTS symptom severity and sensibility measured using two-point discrimination. No significant differences in iatrogenic symptoms secondary to CTR were found between groups in studies by Cook 1995 and Finsen 1999. Only one study (Cebesoy 2007) reported adverse events related to the intervention. Cebesoy 2007 reported that 80% of participants in the splinted group experienced discomfort compared to none in the mobilisation group, which was a statistically significant difference. However, results from these studies (Cebesoy 2007; Finsen 1999; Martins 2006) should be interpreted with caution as they lacked appropriate randomisation.

Two RCTs (Jeffrey 2002; Stevinson 2003) investigated the use of arnica as an intervention compared with a placebo. The results of Jeffrey 2002 suggested no significant differences in grip strength or swelling after seven days of arnica compared with placebo. Stevinson 2003 found that there was no difference between participants who received either high or low doses of oral arnica when compared with a placebo with respect to bruising of the hand post surgery.

Two trials investigated multimodal hand therapy or physiotherapy compared with either a non-graduated home exercise program (pre-operative education regarding tendon gliding exercises, scar management and advice on return to activity) (Pomerance 2007) or a progressive patient-directed home exercise program (Provinciali 2000). Provinciali 2000 did not report outcome data in a manner that allowed further analysis. Pomerance 2007 found no significant differences between groups in the short-term postoperative period or at three months' follow-up for changes in self reported functional ability and impairment measures using grip or pinch strength.

We identified two trials (Ritting 2012; Williams 2008) that compared short duration postoperative dressing to an extended duration dressing. The study by Williams 2008 found no significant differences between short and longer duration dressings for improved functional status and symptom severity on the BCTQ, whilst the study by Ritting 2012 found that patients who had their dressing removed early had better grip and pinch strength. However, there was no participant blinding in either study. These results should be interpreted with caution as participants' assessments of effectiveness may have been influenced by their awareness of the intervention.

One moderate quality randomised trail by Janssen 2009 found that there was no statistically significant difference in the amount of swelling among participants receiving contrast baths plus exercises compared to those receiving contrast baths alone, though statistically significantly more swelling than those receiving exercise alone. Further, those receiving contrast baths alone had statistically significantly more swelling than those receiving exercises alone.

We identified one randomised trial by Hochberg 2001 which compared the effects of controlled cold therapy to ice therapy commenced immediately post surgery and continued for three days. Results from this trial supported the use of controlled cold therapy over ice therapy for both pain and swelling reduction in the short term. However, participants and outcome assessors in this study were not blinded, which may have influenced their expectations of the effect of the interventions.

We identified one quasi-randomised trial which compared low-level laser therapy to a placebo laser (Alves 2011). Trialists found that there was no statistically significant difference in CTS symptoms with low-level laser therapy compared with a placebo. There

were no differences between groups in the return to work outcome at three months post surgery. The results of this trial should be interpreted cautiously as participants were allocated to groups using a quasi-random sequence.

One trial by Fagan 2004 examined elevation using a home elevation device and Bradford sling versus a standard care control group. The trialists found no statistically significant differences between groups in pain or swelling.

Trials conducted by Gordon 2010 (electrical stimulation versus a control group), Huemer 2007 (bulky dressing and splint versus light dressings), Li 2008 (electrical stimulation versus decimeter wave therapy versus a no treatment control) either did not report outcome data in a format that was meaningful, or data were incomplete and could not be analysed.

Overall completeness and applicability of evidence

The evidence in this review is limited in its completeness and applicability. There were a number of important details about the conduct of studies and reporting of data that were not provided by the authors of the included studies. A wide variety of rehabilitation treatments are included in this review which makes it difficult to draw conclusions on the overall efficacy of rehabilitation interventions following CTR. In addition, we were unable to include a number of treatments used in rehabilitation (such as ultrasound, scar massage, mobilisation techniques, strengthening, return-to-work interventions and work modification) in this review because there were no RCTs that evaluated their efficacy. Moreover, two studies (Pomerance 2007; Provinciali 2000) investigated the benefit of a program of multimodal hand therapy, making it difficult to isolate the interventions within the multi-component treatment that could be effective. A number of studies did not report demographic data including gender and age distribution, setting, details of the type of CTS, and eligibility criteria, which limits the potential to generalise findings to a certain population or treatment setting. Only three studies (Alves 2011; Gordon 2010; Pomerance 2007) clearly reported results of interventions at three months or more.

Quality of the evidence

The methodological quality varied greatly across studies. All the studies were small, ranging from 21 (Gordon 2010) to a maximum of 150 participants (Pomerance 2007). Four of the studies had 100 or more participants who underwent CTR and were randomised (Bhatia 2000; Pomerance 2007; Provinciali 2000; Williams 2008). Overall, the risk of bias was high in most studies. Only 11 trials (Bhatia 2000; Bury 1995; Fagan 2004; Gordon 2010; Hochberg 2001; Janssen 2009; Pomerance 2007; Powell 2003; Ritting 2012; Stevinson 2003; Williams 2008) explicitly reported that the sequence was generated in a randomised fashion. Three trials (Pomerance 2007; Powell 2003; Stevinson 2003) adequately concealed the allocation sequence. This is important as inadequate allocation concealment can lead to distortion of treatment effects (Odgaard-Jensen 2011). Four studies (Janssen 2009; Jeffrey 2002; Powell 2003; Stevinson 2003) achieved blinding of both participants and outcome assessors. Lack of blinding of the participants is often unavoidable in situations where the interventions are obvious (for example, type of dressing or intervention versus lack thereof). However, outcomes in these studies should be interpreted with caution due to empirical evidence that lack of blinding may lead to exaggerated treatment effects (Wood 2008). In comparison, blinding of outcome assessors is nearly always possible but was not clearly reported in 11 out of the 20 studies (Alves 2011; Bhatia 2000; Bury 1995; Cebesoy 2007; Cook 1995; Fagan 2004; Finsen 1999; Gordon 2010; Hochberg 2001; Huemer 2007; Li 2008;). The risk of bias from incomplete outcome data was unclear or high for both short-term and long-term data in five studies (Bhatia 2000; Bury 1995; Cook 1995; Finsen 1999; Provinciali 2000), whilst eight studies had a high risk of bias from selective reporting (Bury 1995; Cook 1995; Fagan 2004; Finsen 1999; Gordon 2010; Huemer 2007; Pomerance 2007; Provinciali 2000). Studies with high risk of selective reporting bias are problematic as they can bias the results and conclusions of a systematic review (Kirkham 2010).

Potential biases in the review process

While our methods attempted to minimise bias in the selection of studies for the review, collection of published data and analysis, our searches were limited to electronic databases and clinical trial registries. Although we have included one unpublished study (Powell 2003) identified through a clinical trials database, results of some unpublished studies may have been missed. Furthermore, it was also difficult to obtain all relevant data required for a systematic review from the authors of the included studies, often due to the length of time since some of the studies were completed. It was also difficult to assess selective outcome reporting for some of the studies where study protocols or trial registry data were not available or accessible and where the study authors did not adequately report the methods used.

Agreements and disagreements with other studies or reviews

To our knowledge only three other systematic reviews have been published in this domain (Huisstede 2010; Isaac 2010; Keilani 2002). Keilani 2002 published a review in German which reviewed the effect of mobilisation and splinting interventions on symptoms following CTR by reviewing both randomised and non-randomised studies. This review is awaiting translation. Isaac 2010

reviewed RCTs that compared wrist immobilisation to another intervention or control group in studies that had over 30 participants who had open CTR and were published in English. The Isaac 2010 review identified articles by Bury 1995; Cebesoy 2007; Cook 1995; Finsen 1999; Martins 2006. Huisstede 2010 briefly reviewed rehabilitation interventions following CTR as part of a larger review on the effectiveness of CTR and identified articles by Bury 1995, Cebesoy 2007, Chaise 1994, Cook 1995, Finsen 1999, Hochberg 2001, Huemer 2007, Jeffrey 2002, Martins 2006, Pomerance 2007, Provinciali 2000 and Stevinson 2003. Huisstede 2010 listed the trial by Cook 1995 as a pre-operative intervention rather than a postoperative intervention and it is not clear why it was classified this way.

The findings of our review are generally consistent with the findings of Isaac 2010 and Huisstede 2010 in concluding that there is limited and insufficient evidence to determine a beneficial effect from immobilisation post CTS surgery. However, we believe this review is the most comprehensive yet, as the review by Isaac 2010 did not include the study by Bhatia 2000 and Huisstede 2010 did not include Fagan 2004, Li 2008 or Williams 2008. It is unclear why the search strategies did not identify these trials.

AUTHORS' CONCLUSIONS

Implications for practice

There is limited and very low quality evidence for rehabilitation treatments following CTR. People who have undergone CTR should be provided with sufficient information to make an informed decision about any recommended treatments. They should be informed of the limited evidence of effectiveness and safety of any interventions recommended by the treatment provider. Treatment providers and referrers for treatment should consider the environmental context, nature of the intervention and the patient's preference before recommending a rehabilitation treatment following surgery for CTS. The benefit of rehabilitation treatments in the short term compared to the long term have not been adequately evaluated.

Implications for research

Carpal tunnel release surgery is generally successful in reducing the symptoms of CTS and has few reported adverse events (Verdugo 2008). Therefore, the effects of interventions in improving postoperative outcomes, including function and return to work, need large samples to have the power to detect statistically significant differences between groups. The high success rate of surgery may also contribute to the lack of high quality studies. Secondly, a wide variety of poor outcomes are possible after surgery and it can be difficult to design a study examining multiple outcomes and also control the various confounding variables. This is because poor outcomes can result from either: a failure to relieve the pre-existing symptoms or iatrogenic complications from the surgery itself (for example, scar pain, hypersensitivity or reduced grip strength). However, for those patients who do have persistent symptoms or iatrogenic effects as a result of CTR, research into the effects of various rehabilitation modalities is still relevant and necessary.

Therefore, there is a need for more high quality RCTs to assess the effectiveness and safety of rehabilitation treatments delivered following CTR. There are a number of issues that researchers need to consider when designing a study. These trials should attempt to blind participants and outcome assessors where possible. Trial authors should clearly report demographic details and rehabilitation setting information so that results can be interpreted and applied to similar populations and settings. In addition, data on adverse effects of the rehabilitation intervention rather than the iatrogenic effects of the surgery should be recorded. If participants with bilateral CTS are included in the study, trialists should use appropriate methods and clearly report how bilateral cases were handled in their statistical analysis to prevent a unit of analysis error. Authors should also place trial information on the appropriate clinical trials registers to provide transparent reporting of the methods planned for their study. Moreover, trialists should be careful to include in the study report means and appropriate measures of variability for all outcomes prespecified in their methods, thereby avoiding selective reporting bias. The nature of these interventions and the results reported by trials included in this review, mean that benefit may be observed for early return to function and return-to-work that is not observed at three months or more. However, longer-term effectiveness should not be ignored. Assessment of longer-term benefit following cessation of the intervention should be incorporated in future research. Researchers should focus on postoperative care regimes that have been designed to reduce the symptoms of CTS. They need to measure the severity and type of CTS symptoms pre-operatively and should stratify the patient population accordingly. Additionally, consistent reporting of outcomes (common instruments and timing of outcome assessments) will allow for meta-analysis of similar outcomes in future reviews. The only consistent effects of treatment were in CTS symptom scores and these outcomes therefore might be useful in future studies. Finally, many commonly used rehabilitation treatments have not yet been evaluated for their effectiveness or safety, and these should be included future trials.

ACKNOWLEDGEMENTS

We would like to acknowledge Denise O'Connor and Cathy Dabourn who produced the initial protocol for this review in 2003. We would like to thank Angela Gunn and Ruth Brassington from the Cochrane Neuromuscular Group for their assistance in devising the search strategy, and editorial support. We would also like

to thank the trialists that provided additional information on the included studies.

We would also like to thank the following institutions for their support during the review:

- Brisbane Hand and Upper Limb Research Institute, Brisbane, AUSTRALIA
- School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane, AUSTRALIA

Editorial support from the Cochrane Neuromuscular Disease Group is funded by the MRC Centre for Neuromuscular Diseases.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Alves 2011

Methods	Single-blind RCT Participant blinding
Participants	**Details of sampling frame*** ** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 58 participants (58 wrists) Total n available for follow-up = 58 participants (58 wrists) Total n analysed = 58 participants (58 wrists) Intervention group n = 29 participants (29 wrists) Placebo group n = 29 participants (29 wrists) **Gender distribution** Intervention group: 8 males; 21 females Placebo group: 4 males; 25 females **Mean ± SD (range) age*** Intervention group: 44.3 years ± 11.53 (25 to 80 years) Placebo group: 51.9 years ± 17.69 (24 to 89 years) **Mean ± SD (range) duration of CTS symptoms*** Intervention group: 1.97 years ± 2.04 months (6 months to 10 years) Placebo group: 2.17 years ± 2.40 months (6 months to 10 years) **Inclusion criteria** 1.Clinical and electroneuromyographic diagnosis of CTS 2. Normal laboratory tests (leukogram, erythrogram, coagulogram, glucose, urea, creatinine, sodium, potassium) and wrist radiographs without osteoarticular lesions **Exclusion criteria** 1. Osteoarticular wrist lesions 2. Other surgical procedures to the wrist 3. Infiltration to the site previously 4. Pregnant or breastfeeding women 5. Use of an experimental drug 6. Active infection 7. Myocardial infarct <6 months earlier 8. Other disease without adequate clinical control **Details of surgical intervention** Open carpal tunnel release (CTR) **CTS diagnostic criteria (case definition)** CTS diagnosis was based on both a clinical and electroneuromyographic diagnosis of CTS **Symptom severity** Moderate to severe CTS symptoms using Gelberman et al classification (Gelberman 1998)*
Interventions	**Intervention group 1: low-level laser therapy** Low-level laser therapy (with a aluminium gallium Ibramed laser pen, wavelength 830

	nm, power 30 mW) performed in 10 daily, consecutive sessions with an interval of 2 days using a total of 3 J, at 3 points of the carpal tunnel (CT) (pisiform, middle of the CT, distal limit of CT) **Placebo group 2: sham therapy** Placebo laser therapy (performed in 10 daily, consecutive sessions with an interval of 2 days using a total of 3 J, at 3 points of the CT (pisiform, middle of the CT, distal limit of CT)
Outcomes	Outcomes*** were assessed at 2 weeks, 1, 2, 3 and 6 months after surgery or until participant was asymptomatic and discharged from treatment**** 1. Pain (palmar, pillar, night-time) (all time points) 2. Scar pain or discomfort (all time points) 3. Paraesthesia (measured at all time points; results obtained from trial authors)* 4. Numbness (measured at all time points) 5. Clinical signs of CTS, i.e. numbness, nocturnal pain, paraesthesia, pain, positive Tinel's sign, positive Durkan's test, positive Phalen's test (measured at all time points)* 6. Time to return to ADL or work (measured at six months or the end of treatment period) 7. Electroneuromyography (six months or when the participant was asymptomatic) ***** 8. Adverse event (surgery)
Notes	*Authors contacted to clarify data and further clarification was provided as indicated **Personal communication with the trialist confirmed that no participants had bilateral CTS Quote (unpublished data): "Only one wrist per participant *was contributed*." Comment: Data are reported to be based on the number of participants which is equal to the number of wrists included. Hence a unit of analysis error is unlikely to have occurred. *** The method for measuring outcomes was not reported in the publication. ****Mean time to discharge was reported by the trial authors, "Thus in both groups the mean time to discharge was 3.6 months, whereas in group 1 it ranged from one to six months to discharge, and in group 2 from one to eight months" (p. 699) ***** This outcome was not specified in our review so data were not entered for statistical analysis.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "Patients were randomly and sequentially divided into two groups." Quote (unpublished data): "Patients were sequentially divided into two groups (the even numbers were for laser, the odd numbers were for placebo)." Comment: Random sequence was not adequately generated

Allocation concealment (selection bias)	High risk	Quote: "Patients were randomly and sequentially divided into two groups." Quote (unpublished data): "Patients were sequentially divided into two groups (the even numbers were for laser, the odd numbers were for placebo). Comment: Allocation apparently not adequately concealed
Blinding (performance bias and detection bias) Self reported outcomes	Low risk	Quote: "Neither groups of patients knew the identity of the members of the placebo group or treatment group." Comment: Participants were blind to intervention
Blinding (performance bias and detection bias) Other outcomes	High risk	Quote: " We did not achieve the necessary structure to exclude the surgeon's awareness of the group to which the patient's belonged." Quote: "Both groups were assessed regularly by the surgeon after the procedure, in visits two weeks after the surgery, and in the first, second, third and sixth postoperative months or until patients were asymptomatic and capable of returning to work or their civilities of daily living. During the visits, they were evaluated in terms of symptoms of palmar pain, pillar pain, paraesthesia, nighttime pain, pain or discomfort at the site of the scar and Tinel's test, as well as time taken to return to activities of daily living or to work." Quote: "The electroneuromyographs were executed by examiners who did not come into contact with the study data." Comment: Treaters were not blind to intervention nor were the majority of outcome assessments blinded. The outcome assessors for the electromyographs were most probably blind to the intervention.
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "No patients abandoned the study. " Comment: the reported data is likely to be based on a complete sample
Incomplete outcome data (attrition bias) After 12 weeks	Low risk	Quote: "No patients abandoned the study. " Comment: the reported data is likely to be based on a complete sample
Selective reporting (reporting bias)	Low risk	Comment: All outcomes specified in the methods section of the publication were reported in the pre-specified way, except electroneuromyographic evaluations. It is unclear in the publication how the percentage of ab-

		normal findings at baseline (pre-operation) and on discharge or 6 months were calculated and recorded. This was later clarified with the trial authors and results were entered into RevMan accordingly
Other bias	Low risk	No other sources of bias identified.

Bhatia 2000

Methods	RCT No blinding
Participants	**Details of sampling frame*** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 130 participants Total n available for follow-up = 102 participants Total n analysed = 102 participants Intervention group 1, n = 45 completed trial Intervention group 2, n = 57 completed trial **Gender distribution** Not reported **Mean ± SD (range) age** Not reported **Mean ± SD (range) duration of CTS symptoms** Not reported **Inclusion criteria** 1. Patients undergoing carpal tunnel surgery discharged home on the same day No exclusion criteria specified **Details of surgical intervention** Type of surgical release (open, mini-open or endoscopic) not reported. Operation performed under local anaesthetic with tourniquet control **CTS diagnostic criteria (case definition)** Not reported **Symptom severity** Not reported
Interventions	**Group 1: splint for 48 hours post operation** Immobilisation (volar plaster of Paris splint) for the first 48 hours after surgery **Group 2: bulky dressing for 48 hours post operation** Bulky wool and crepe bandage dressing for the first 48 hours after surgery Participants were advised to remove the splint or dressing 48 hours postoperatively. They were discharged home with a supply of co-proxamol tablets for pain relief for 72 hours
Outcomes	Participants assessed their outcome twice daily for 72 hours after surgery. Outcome data were returned to the researchers 2 weeks postoperatively. 1. Number of co-proxamol tablets taken (recorded by participants on score sheet provided by researchers)**

Bhatia 2000 (*Continued*)

	2. Pain intensity on a VAS***
Notes	*The number of CTS affected wrists in this trial was not reported, so a unit of analysis variance may have occurred **This outcome was not specified in our review so data were not entered for statistical analysis. ***Mean and SD values for this outcome measure were not reported Attempts to contact the trial authors for incomplete or unclear data were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The patients were randomised using random number tables to receive either a palmar plaster splint or a bulky wool and crepe bandage postoperatively." Comment: The allocation sequence was probably adequately generated
Allocation concealment (selection bias)	Unclear risk	Quote: "The patients were randomised using random number tables to receive either a palmar plaster splint or a bulky wool and crepe bandage postoperatively." Comment: Not enough information to determine whether allocation concealment adequate
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Quote: "A prospective randomised single blind trial was performed of 102 patients undergoing carpal tunnel release." Comment: The trial authors do not specify whether participants were blinded but the nature of the interventions make it unlikely
Blinding (performance bias and detection bias) Other outcomes	Unclear risk	Quote: "A prospective randomised single blind trial was performed of 102 patients undergoing carpal tunnel release." Comment: The authors do not specify whether outcome assessors were blind
Incomplete outcome data (attrition bias) 12 weeks or less	Unclear risk	Quote: "Of the 130 patients entered into the study, 102 completed the protocol." Comment: Reasons for attrition/exclusions were not reported
Incomplete outcome data (attrition bias) After 12 weeks	High risk	Comment: The final follow-up was at 72 hours post-surgery or 24 hours after the intervention ceased
Selective reporting (reporting bias)	Low risk	Comment: All outcomes specified in the methods section of the publication were reported in the pre-specified way
Other bias	Low risk	No other sources of bias identified.

Bury 1995

Methods	RCT No blinding reported
Participants	**Details of sampling frame*** ** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 47 participants Total n available for follow-up = 40 participants (43 wrists) Total n analysed = 40 participants (43 wrists) Intervention group 1, n = 26 Intervention group 2, n = 17 **Gender distribution** Group 1: 2 males; 24 females Group 2: 2 males; 15 females **Mean ± SD (range) age***** Intervention group 1: 43 yrs (range 19 to 79 yrs) Intervention group 2: 39 yrs (range 21 to 74 yrs) **Mean ± SD (range) duration of CTS symptoms***** Duration of CTS symptoms for both groups was 13 months (range 5 to 36 months). No group specific data were provided **Inclusion criteria** Patients diagnosed with CTS and scheduled for surgery following failed conservative management using wrist splinting **Exclusion criteria** Patients who had undergone prior carpal tunnel surgery **Details of surgical intervention** 1. Open CTR 2. A 3 cm parathenar longitudinal incision without extension proximal to the volar wrist flexion crease 3. Performed under tourniquet control 4. Transverse carpal ligament not reconstructed **CTS diagnostic criteria (case definition)** 1. History characteristic of CTS 2. Physical examination consistent with the diagnosis including a positive Phalen's test 3. Positive electrodiagnostic evidence of median nerve compression at the wrist **Symptom severity** Not reported
Interventions	**Group 1: Bulky dressing plus splint for 2 weeks post operation** Immobilisation (bulky dressing and neutral wrist splint) for 2 weeks after surgery **Group 2: Bulky dressing for 2 weeks post operation** Bulky dressing using a bandage for 2 weeks after surgery
Outcomes	Outcome ***assessed at mean follow-up period of 6 months postoperatively (range 3.8 to 7.8 months) 1. Patient-reported outcome rated on a scale from 1 to 10 (0 = terrible outcome, 10 = excellent outcome)**** 2. Patient-reported satisfaction with operation rated as worse, unchanged, improved

	or cured at final follow-up**** 3. Frequency of residual or recurrent symptoms (reported by the participant) 4. Frequency of complications (reported by the participant) 5. Digital range of motion- methods of measurement not described**** 6. Wrist range of motion (in degrees) - flexion and extension measurements reported, method of measurement not described**** 7. Grip strength (kg) - the mean of 3 consecutive trials using the Jamar dynamometer (second handle position) and the method described by Mathiowetz (1984) 8. Lateral pinch strength (kg) - the mean of 3 trials using the B & L pinch gauge 9. Thenar muscle function - method for measurement not described****
Notes	*Quote: "32 of 40 patients had bilateral symptoms and 3 patients underwent staged bilateral surgery during the trial period." Quote: "The ratios of...bilateral symptoms...were not statistically significantly different between the two treatment groups (p>0.05)." Although the distribution of bilateral cases between groups was not statistically significant, a unit of analysis error may have occurred, although this is not clearly reported in the publication **Data only reported for participants completing treatment. Note also, 3 participants had bilateral procedures ***Measures of variability (SDs) for these outcome measures were not reported. An attempt to obtain the required data from trial authors was unsuccessful ****Data on these outcomes were not reported in published trial An attempt to obtain the data from the trial authors were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "After the decision was made to intervene surgically, informed consent was obtained and each patient was randomised by a random number generator into two groups." Comment: The allocation sequence was probably generated adequately
Allocation concealment (selection bias)	Unclear risk	Quote: "After the decision was made to intervene surgically, informed consent was obtained and each patient was randomised by a random number generator into two groups." Comment: Not enough information to determine whether allocation concealment adequate
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Not reported, but due to the nature of the interventions (splint or bulky dressing), it is unlikely that blinding occurred
Blinding (performance bias and detection bias) Other outcomes	Unclear risk	Comment: Not enough information to determine whether outcome assessors were blinded

Bury 1995 (*Continued*)

Incomplete outcome data (attrition bias) After 12 weeks	Unclear risk	Quote: "Seven patients with eight carpal tunnel releases were lost to follow up, leaving 40 cases with 43 procedures available for review. Twenty-six had a postoperative splint for 2 weeks and 17 hand only a bulky dressing placed. " Comment: The authors do not report how many participants were randomised to each group at inception, so it is unclear how many were lost to follow-up from each group. In addition, the timing of outcome assessment for each participant is unclear as outcomes were assessed at follow-up (range 3.8 to 7.8 months)
Selective reporting (reporting bias)	High risk	Comment: The majority of outcomes pre-specified in the methods were reported in the results section, but only in terms of mean scores and of being "statistically or non-statistically significant" (with no P values provided, only an indication that P < 0.05 or P > 0.05). No SD or SE values were reported for any of the outcomes. Results for the outcome "thenar muscle function" were not reported
Other bias	Low risk	No other sources of bias identified.

Cebesoy 2007

Methods	Quasi-RCT No blinding reported
Participants	**Details of sampling frame** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 46 participants (46 wrists)* Total n available for follow-up = 40 participants (40 wrists)* Total n analysed = 40 participants (40 wrists)* Intervention group 1, n = 20 participants (20 wrists)* Intervention group 2, n = 20 participants (20 wrists)* **Gender distribution** Group 1: 7 males; 13 females Group 2: 5 males; 15 females **Mean ± SD (range) age**** Group 1: 36 years (32 to 44 years) Group 2: 37 years (33 to 43 years) **Mean ± SD (range) duration of CTS symptoms** Group 1: not reported Group 2: not reported **Inclusion criteria** Idiopathic CTS that was unresponsive to conservative treatment and booked for carpal tunnel surgery **Exclusion criteria** 1. History of wrist or median nerve injury from trauma or primary surgery on the

Cebesoy 2007 (*Continued*)

	wrist 2. Diagnosis of bilateral CTS 3. History of underlying causes of CTS such as diabetes, thyroid disease, rheumatoid arthritis, chronic renal failure treated by haemodialysis, space-occupying lesions in the volar wrist area, anatomic abnormalities of the wrist or hand, pregnancy or lactation 4. Severe thenar muscle atrophy **Surgical details** Open CTR **CTS diagnostic criteria (case definition)** Pain (especially night pain), numbness and tingling in the median innervated fingers, positive Tinel's sign, positive Phalen's sign **Symptom severity** Pre-operative symptom severity was reported as an outcome using the BCTQ
Interventions	**Intervention group 1: Splint with plaster of Paris cast** Plaster of Paris splint applied after wound closure and worn until sutures were removed (approximately 10 days post operation), plus standard physical exercises after splint was removed at 10 days. Splint immobilised the wrist to the metacarpophalangeal (MCP) joint heads. **Intervention group 2: Bulky dressing and physical exercises** Bulky dressing applied after wound closure and worn until sutures were removed (approximately 10 days post operation), plus standard physical exercises immediately after surgery. Dressing allowed wrist and finger mobility. Both groups were discharged on the day of surgery and were given paracetamol for 2 days' pain relief.
Outcomes	Outcomes assessed preoperatively and 1 and 3 months postoperatively and included: 1. BCTQ : i) Symptom Severity Score ii) Functional Status Score** 2. Adverse events / iatrogenic symptoms (postoperative difficulties or flexor tendon bowstringing as reported by the participant) 3. Economic analysis (dressing vs splint)***
Notes	* Quote: "Patients were excluded from this study if they had:...(2) a diagnosis of bilateral CTS..." Comment: a unit of analysis error could not have occurred ** SDs not reported in the publication. ***This outcome was not specified in our review so data were not entered into RevMan Attempts to contact the trial authors for missing or unclear information were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	"After inclusion and exclusion criteria had been applied, patients were randomly divided into 2 groups. Patient chart numbers given by the secretary were used for randomisation. If the chart number was even, the patient was assigned to the

Cebesoy 2007 (*Continued*)

		splint group. If the number was odd, the patient was given a bulky bandage postoperatively." Comment: A non-random process was used to general the allocation sequence.
Allocation concealment (selection bias)	High risk	"After inclusion and exclusion criteria had been applied, patients were randomly divided into 2 groups. Patient chart numbers given by the secretary were used for randomisation. If the chart number was even, the patient was assigned to the splint group. If the number was odd, the patient was given a bulky bandage postoperatively." Comment: Allocation potentially foreseeable by investigators enrolling participants, which represents a risk of selection bias
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Not reported, but due to the nature of the intervention (splint versus bulky bandage), it is unlikely that blinding occurred
Blinding (performance bias and detection bias) Other outcomes	High risk	Comment: Blinding of participants and personnel not reported, and outcomes were all subjective. Given the nature of the interventions, it is unlikely that blinding occurred
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "Three patients in each group did not receive proper follow-up and were excluded from the study during the final evaluation. They reported no problems during the phone interview. In all, 40 patients remained at the time of the final evaluation." Comment: It is clear in the publication that all data are based on 40 participants with CTS, and clear from which groups the patients were excluded
Selective reporting (reporting bias)	Low risk	Comment: All outcomes specified in the methods were fully reported in the results section of the publication
Other bias	Low risk	No other sources of bias identified.

Cook 1995

Methods	RCT No blinding
Participants	**Details of sampling frame*** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 50 participants (50 wrists)

	Total n available for follow-up = not reported Total n analysed = not reported Intervention group 1, n = 25 participants (25 wrists) Intervention group 2, n = 25 participants (25 wrists) **Gender distribution** Not reported **Mean ± SD (range) age** Not reported **Mean ± SD (range) duration of CTS symptoms** Not reported **Inclusion criteria** Isolated, uncomplicated idiopathic CTS scheduled for carpal tunnel surgery **Exclusion criteria** 1. Systemic disease (diabetes mellitus, thyroid disease, generalised peripheral neuropathy, vasospastic disease, active psychiatric disorder, pregnancy, reflex sympathetic dystrophy, chronic renal failure requiring dialysis, gout, amyloidosis) 2. Proximal neuropathy of the same arm 3. Previous injury of the affected wrist or median nerve 4. Severe thenar weakness 5. Simultaneous ipsilateral upper extremity surgery 6. CTS resulting from an acute injury **CTS diagnostic criteria (case definition)** 1. History, symptoms, physical examination consistent with CTS 2. Electrodiagnostic tests of the median nerve at the wrist (motor distal latency >4.5 msec and sensory antidromic latency >3.5 msec) **Details of surgical intervention** 1. Open CTR 2. Performed under local or regional anaesthesia and tourniquet control in an outpatient setting 3. A curved incision was made just ulnar to the thenar crease from the cardinal line proximally crossing the wrist crease in an ulnar direction. Flexor retinaculum incised, canal inspected and proximal 3 cm of antebrachial fascia incised **Symptom severity** Not reported
Interventions	**Intervention group 1: immobilisation using a splint for 2 weeks post-operation** Volar wrist splint with wrist in neutral, allowing full finger motion for 2 weeks after surgery. Mean wear time was 13.2 days. **Intervention group 2: mobilisation at 1 day post operation** The soft bulky bandage applied at surgery was removed on the first postoperative day. A sticking plaster was applied to the wound and participants were allowed unrestricted active mobilisation from day 1
Outcomes	Outcomes *** were assessed at 2 weeks, and at 1, 3 and 6 months postoperatively and included: 1. Time to return to normal activities of daily living(personal hygiene, food preparation, dressing) (recorded date of resumption and total number of days from surgery)** 2. Time to return to work on light duty (recorded date of resumption and total

Cook 1995 (*Continued*)

	number of days from surgery; determined jointly by participant and surgeon) 3. Time to return to work on full duty (recorded date of resumption and total number of days from surgery; determined jointly by participant and surgeon) 4. Grip strength (kg) - measurement tool or method not described 5. Lateral (key) pinch strength (kg) - measurement tool or method not described 6. 2-point discrimination - measurement tool or method not described 7. Light touch sensibility using Semmes-Weinstein monofilaments** 8. Pain intensity on scale from 1 to 10 9. Patient-reported opinion of overall outcome rated as excellent, good, fair, poor (dichotomised for review as excellent/good vs fair/poor) 10. Frequency of complications (wound dehiscence, reflex sympathetic dystrophy, superficial or deep infection, bowstringing of tendons, painful or hypertrophic scar, neuroma formation, persistence of preoperative symptoms, pillar pain, injury to median nerve, injury to the palmar cutaneous branch of the median nerve, adherence of flexor tendons, and hematoma)
Notes	*Quote: "Patients with isolated, uncomplicated carpal tunnel syndrome scheduled for treatment by surgical release of the flexor retinaculum were included in this study." It is clear that all participants contributed only 1 wrist to the analysis **Measures of variability (SDs) for these outcome measures were not reported *** Some outcomes not reported numerically or graphically in the publication Attempts to obtain missing or unclear data from the trial authors were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Patients were randomised to two groups for postoperative management." Comment: Insufficient information to determine the adequacy of the sequence generation
Allocation concealment (selection bias)	Unclear risk	Quote: "50 consecutive patients meeting the entrance criteria gave informed consent, enrolled in the study and were randomly divided into two groups of 25 patients each." Comment: Insufficient information to determine adequacy of allocation concealment
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Not reported, but due to the nature of the interventions, it is unlikely that blinding occurred
Blinding (performance bias and detection bias) Other outcomes	Unclear risk	Comment: Not enough information to determine whether outcome assessors were blinded
Incomplete outcome data (attrition bias) 12 weeks or less	Unclear risk	Comment: Withdrawals or losses to follow-up were not reported by the trial authors, but this does not mean there were none

Cook 1995 (*Continued*)

Incomplete outcome data (attrition bias) After 12 weeks	Unclear risk	Comment: Withdrawals or losses to follow-up were not reported by the trial authors, but this does not mean there were none
Selective reporting (reporting bias)	High risk	Comment: Incomplete outcome reporting for most outcomes (for example, reported only as 'significantly different', with no numerical data). Hence data could not be entered into RevMan. Most of the outcomes were not reported on at the pre-specified time points. Results for pain intensity were not reported at all
Other bias	Low risk	No other sources of bias identified.

Fagan 2004

Methods	RCT No blinding reported
Participants	**Details of sampling frame*** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 43 participants (43 wrists) Total n available for follow-up = 41 participants (41 wrists) (1 participants from each group was withdrawn) Total n analysed = 41 participants (41 wrists) (1 participants from each group was withdrawn) Intervention group 1 n, = 21 wrists randomised; 20 wrists completed Standard care group 2, n = 22 wrists randomised; 21 wrists completed **Gender distribution** 16 males, 27 females **Mean ± SD (range) age** Intervention group 1: 44 yrs (SD and range not reported) Standard care group 2: 47 yrs (SD and range not reported) **Mean ± SD (range) duration of CTS symptoms** Not reported **Inclusion criteria** Patients booked to undergo day-case, primary carpal tunnel decompression **Exclusion criteria** 1. Undergoing revision surgery or had recently undergone other hand surgery 2. Concurrent disease of the hand such as Dupuytren's contracture or rheumatoid arthritis 3. Post-traumatic CTS 4. Deemed too infirm to be able to erect the sling or understand its use **CTS diagnostic criteria (case definition)** Not reported **Details of surgical intervention** 1. Open CTR 2. Operation performed by single surgeon 3. Same procedure for all participants, but no specific details of surgery provided

Fagan 2004 (*Continued*)

	Symptom severity Not reported
Interventions	**Intervention group: elevation** Home elevation device and Bradford sling (a foam, dog-leg shaped support which wraps around the elbow and lower arm) was used for 5 days following CTR. The sling was suspended, allowing vertical elevation of the hand with the elbow at approximately 90°. The home elevation device allowed patients to suspend the Bradford sling at home. Participants were instructed to use the sling device during sleep as much as practicable. When ambulant, they were instructed to use a high crepe arm sling with the elbow flexed approximately 45° and the hand above the heart **Standard care group: no elevation** A standard crepe sling which held the elbow at approximately 90° was worn for 5 days following CTR. Participants were instructed to use the sling as much as required for comfort, and to sleep as normal
Outcomes	1. Hand volume using a volume displacement apparatus. The hand is inserted into a tank of water to a reproducible level on each occasion, and the observer measures the displaced water (ml) in a measuring cylinder, which is equal to the volume of the hand. This was then repeated 3 times and a mean calculated. This outcome was assessed before surgery and at the end of treatment (5 days post-surgery) 2. Pain using a visual analogue scale once a day for 5 days after surgery** 3. Analgesic use recorded by participants on a chart, to indicate the number of analgesics used each day for 5 days***
Notes	* It was clear that all participants had only 1 CTS-affected hand because volumetric measurements were taken of the "operated hand" and the "non-operated hand". A unit of analysis error could not have occurred ** The measurement units were not stated, but we assume from the results in Table 1 pg 460 that a 0 to 10 VAS scale was used *** This outcome was not specified in our review so data were not entered for statistical analysis Attempts to contact the trial authors for incomplete or unclear data were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "On admission to the day-case unit the patients were consented and randomised to the treatment or control group by envelope draw." Comment: The random sequence was probably adequately generated
Allocation concealment (selection bias)	Unclear risk	Quote: "On admission to the day-case unit the patients were consented and randomised to the treatment or control group by envelope draw." Comment: It is not clearly reported whether the envelopes were sequentially numbered, opaque, and sealed

Fagan 2004 (*Continued*)

Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Not reported, but due to the nature of the interventions, it is unlikely that participants could have been blind to which treatment they received
Blinding (performance bias and detection bias) Other outcomes	Unclear risk	Quote: "To reduce observer error, our hand physiotherapist measured both pre- and postoperative volumes for each patient." Comment: Not enough information to determine whether the outcome assessor was blind to treatment allocation
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "One patient in each group was withdrawn because of failure to attend research follow-up, although they were seen for routine follow-up." Comment: Withdrawals clearly reported and unlikely to have biased estimates of treatment effect sizes
Selective reporting (reporting bias)	High risk	Comment: VAS pain was recorded daily for 5 days but only 1 mean value was reported by the authors. Also, analgesic use was only reported in terms of there being no significant difference between groups (with no numerical data or P values reported)
Other bias	Low risk	No other sources of bias identified.

Finsen 1999

Methods	Quasi-RCT No blinding reported
Participants	**Details of sampling frame*** Total n eligible = not reported* Total n excluded pre-randomisation = not reported Total n randomised = 74 participants (82 wrists) Total n available for follow-up = not reported Total n analysed = not reported Intervention group 1, n = 37 hands Intervention group 2, n = 45 hands **Gender distribution** Group 1: 11 males; 26 females Group 2: 11 males; 34 females **Mean ± SD (range) age** Intervention group 1: 51 yrs (range 21 to 86 yrs) (measures of variability not reported) Intervention group 2: 48 yrs (range 26 to 80 yrs) (measures of variability not reported) **Mean ± SD (range) duration of symptoms** Not reported **Inclusion criteria** Patients diagnosed with CTS scheduled for open surgery with trial author **Exclusion criteria**

	No disease or recent injuries that would interfere with grip strength measurements **CTS diagnosis (case definition)***** CTS diagnosis made clinically by surgeon **Details of surgical intervention** 1. Open CTR 2. Performed under local anaesthesia and tourniquet control in an outpatient setting 3. The incision paralleled the thenar crease and extended 1 to 2 cm proximal to the wrist crease 4. Procedures performed by, or assisted with, 1 experienced hand surgeon (trial author) Eight participants had bilateral operations **Symptom severity***** Moderate to severe CTS determined by surgeon
Interventions	A bulky compression dressing was applied to all participants' operated hands after the operation. This was removed 2 days postoperatively and participants received treatments as outlined below: **Intervention group 1: immobilisation for 4 weeks post operation** A plaster wrist splint positioned in slight dorsiflexion was applied to the operated hand (s) of participants for 2 weeks after surgery. After 2 weeks, the sutures were removed and the plaster splint was replaced with a simple rigid orthosis for an additional 2 weeks. Both splints allowed full finger motion. Total time wearing splint was 4 weeks. Note: authors stated that additional physiotherapy treatment was not usually prescribed, but its frequency was not specified **Intervention group 2: early mobilisation post operation** The bulky compression dressing applied at surgery was removed on the second postoperative day and replaced with light dressings. Participants were allowed to actively mobilise the wrist and fingers of their operated hand(s) within the limits of comfort but asked to avoid heavy lifting for the first 6 postoperative weeks
Outcomes	Outcomes** assessed preoperatively, at 6 weeks, and 6 months postoperatively. 1. Grip strength (% of pre-op value) - the median of 3 trials using the Jamar dynamometer was recorded 2. Lateral (key) pinch strength (% of pre-op value) - the median of 3 trials using the Jamar dynamometer was recorded 3. 4/5 Pinch strength (pinch strength between thumb and 4th and 5th digits) (% of pre-operative value) - the median of 3 trials using the Jamar dynamometer was recorded 4. Frequency of complications (scar discomfort or pain, hypothenar pain, thenar pain, hematoma, wound discharge) 5. Pain intensity in the previous week (indicated by participant on a VAS, later measured and scored out of 100: 0 = no pain, 100 = unbearable pain. Participants were asked to disregard any discomfort or pain which had arisen after the operation and give a VAS evaluation only of remaining discomfort of the type they had preoperatively 6. Time to return to work (weeks). Only reported for participants who were previously employed (n = 19 immobilisation group; n = 28 mobilisation group)
Notes	*Eight bilateral cases were included. Hands of bilateral procedures were assigned to alternate treatment groups and were analysed as separate observations. Unit of analysis error likely

	Results for these outcomes were reported as median values and 95% CIs and analysed using non-parametric statistical analysis (suggesting skewed data). These data was therefore not entered into RevMan for analysis. Trial authors were unable to provide raw data or statistical analysis suitable for inclusion in RevMan * Data obtained from communication with the trial authors.

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "Randomization was performed by adding up the 11 digits in the patient's social security number. When the sum was an odd number, he was allocated to one study group, when it was even, he was allocated to the other." Comment: A quasi-random process was used to generate the allocation sequence
Allocation concealment (selection bias)	High risk	Quote: "Randomization was performed by adding up the 11 digits in the patient's social security number. When the sum was an odd number, he was allocated to one study group, when it was even, he was allocated to the other." Comment: High risk of bias as investigators could possibly foresee assignments
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Not reported, but due to the nature of the interventions (immobilisation versus no immobilisation), it is unlikely that participants were blind to treatment allocation
Blinding (performance bias and detection bias) Other outcomes	Unclear risk	Quote: "To reduce bias, the investigator who had seen the patient preoperatively, and in many cases done the operation, did not perform the postoperative follow-ups." Comment: Not enough information to determine whether the assessors were blind to treatment allocation for all outcomes
Incomplete outcome data (attrition bias) 12 weeks or less	High risk	Comment: The authors report on 7 participants classified as 'protocol deviants' and indicate that these were "retained in their allotted groups". No withdrawals or losses to follow-up were reported, but the data in Table 2 are based on fewer than the complete sample at 6 weeks' follow-up, with no explanation as to why
Incomplete outcome data (attrition bias) After 12 weeks	High risk	Comment: The authors report on 7 participants classified as 'protocol deviants' and indicate that these were "retained in their allotted groups". No

Finsen 1999 (*Continued*)

		withdrawals or losses to follow-up were reported, but the data in Table 2 are based on fewer than the complete sample at 6 months follow-up, with no explanation as to why
Selective reporting (reporting bias)	High risk	Comment: The authors report on the results for the outcomes of scar discomfort or pain, hypothenar pain, thenar pain, and number of days to return to work; however, none of these were pre-specified in the methods section of the publication. All other outcomes pre-specified in the methods were reported
Other bias	Low risk	No other sources of bias identified.

Gordon 2010

Methods	RCT No blinding reported
Participants	**Details of sampling frame*** Total n eligible = 25 participants (25 wrists) Total n excluded pre-randomisation = 0 participants Total n randomised = 25 participants (25 wrists) Total n available for follow-up = 21 participants (21 wrists) Total n analysed = 21 participants (21 wrists) Intervention group 1, n = 13 participants randomised; 11 completed Intervention group 2, n = 12 participants randomised; 10 completed **Gender distribution** Group 1: 5 males; 6 females Group 2: 3 males; 7 females **Mean ± SD (range) age** Group 1: 53 (SE = 18) (range not reported) Group 2: 61 (SE = 16) (range not reported) **Mean ± SD (range) duration of CTS symptoms** Group 1: not reported Group 2: not reported **Inclusion criteria** 1. Numbness and tingling in the median nerve distribution 2. Precipitation of these symptoms by repetitive hand activities and relieved by resting, rubbing, and shaking the hand 3. Nocturnal awakening by such sensory symptoms 4. Weakness of thumb abduction and thenar muscle atrophy **Exclusion criteria:** 1. Electrophysiological evidence of conduction block across the carpal tunnel 2. Presence of other neurological conditions 3. Previous CTR surgery **CTS diagnostic criteria (case definition)**

	1. Numbness and tingling in the median nerve distribution 2. Precipitation of these symptoms by repetitive hand activities and relieved by resting, rubbing, and shaking the hand 3. Nocturnal awakening by such sensory symptoms 4. Weakness of thumb abduction and thenar muscle atrophy 5. The presence of median nerve compression confirmed by nerve conduction studies (Viking Select EMG machine) **Surgical details** • Open CTR • Performed without epineurotomy or neurolysis was performed by 1 plastic surgeon using a tourniquet • Curvilinear incision over the palm dividing the TCL along the ulnar side of the incision performed under local anaesthesia **Symptom severity** Moderate to severe CTS or progressive symptoms for at least 2 years
Interventions	**Group 1: Electrical stimulation of the median nerve for 1 hour commenced 30 min post surgery** With the participant in the lying position, the operated hand was stabilised in an elevated position. The stimulating electrodes were connected to a Grass (SD9) stimulator: the proximal wire electrode was connected to the cathode and the distal one to the anode. The surface electrodes on the thenar eminence were connected to an electromyography machine (NeuroSoft Inc., Virginia). The trial investigators gradually increased the stimulation intensity to the maximal tolerance limit (4 to 6 V, 0.1 to 0.8 ms duration) as a continuous 20 Hz train for 1 hour. These intensities were sufficient to induce a fused tetanic contraction but not to induce excessive discomfort. **Group 2: No treatment control**
Outcomes	Outcomes were assessed twice pre-operation and at 3, 6 to 8, and 12 months post operation and included: 1. Nerve conduction studies (transcarpal sensory conduction velocity, sensory nerve action potential, compound muscle action potential, terminal motor latency, motor conduction velocity, surface-detected motor unit action potential, motor unit number estimation (calculated as the peak-to-peak amplitude of the maximum compound muscle action potential divided by the peak-to-peak amplitude of the average surface-detected motor unit action potential)** 2. BCTQ Symptom Severity Score** 3. BCTQ Functional Status Score** 4. Hand sensibility using the Semmes Weinstein monofilaments** 5. Hand dexterity using the Purdue Pegboard Test**
Notes	*All participants had bilateral CTS, though only provided 1 wrist for treatment. Therefore, a unit of analysis error could not have occurred ** Statistics were represented graphically and not numerically so could not be entered into RevMan for analysis Attempts to obtain missing or unclear data from the trial authors were unsuccessful
Risk of bias	

Gordon 2010 (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Subjects were randomised to the control or the stimulation group by using the random number generation function in a commercially available software program (Excel, Microsoft Inc.)." Comment: Random sequence appears to have been adequately generated
Allocation concealment (selection bias)	Unclear risk	Quote: "Subjects were randomised to the control or the stimulation group by using the random number generation function in a commercially available software program (Excel, Microsoft Inc.)." Comment: Method to conceal allocation sequence not reported
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Blinding of participants and personnel was not reported, but given the nature of the interventions it is unlikely that blinding occurred
Blinding (performance bias and detection bias) Other outcomes	Unclear risk	Comment: Blinding of assessors of objective outcomes was not reported. Although this could have occurred, it can not be assumed
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "Twenty five eligible CTS subjects participated in the study, all of whom had surgical decompression of the carpal tunnel under local anaesthesia (1% lidocaine) . However, 4 subjects (2 males and 2 females) withdrew from the study because of development of other medical conditions or occupational commitments which prevented them to return for follow up. Two of these patients belonged to the control and 2 to the stimulation group. Therefore, the results are from 21 subjects: 8 males and 13 females" Quote: "Ten patients were assigned to the control group (no electrical stimulation, ES) and 11 patients to the stimulation group (1 h 20 Hz ES). All subjects attended the first postoperative follow-up, whereas 19 of them were available for the second and third postoperative evaluations. Two of the subjects who missed appointments belonged to the control and one to the stimulation group." Comment: Number and reasons for incomplete outcome data were reported, and are unlikely to have impacted on the results
Incomplete outcome data (attrition bias) After 12 weeks	Low risk	Quote: "Twenty five eligible CTS subjects participated in the study, all of whom had surgical decompression of the carpal tunnel under local anaesthesia (1% lidocaine) . However, 4 subjects (2 males and 2 females) withdrew from the study because of development of other medical conditions or occupational commitments which pre-

Gordon 2010 (*Continued*)

		vented them to return for follow up. Two of these patients belonged to the control and 2 to the stimulation group. Therefore, the results are from 21 subjects: 8 males and 13 females" Quote: "Ten patients were assigned to the control group (no electrical stimulation, ES) and 11 patients to the stimulation group (1 h 20 Hz ES). All subjects attended the first postoperative follow-up, whereas 19 of them were available for the second and third postoperative evaluations. Two of the subjects who missed appointments belonged to the control and one to the stimulation group." Comment: Number and reasons for incomplete outcome data were reported, and are unlikely to have impacted the results
Selective reporting (reporting bias)	High risk	Comment: All outcome data are reported in figure format (as either mean or median ± SD) for all outcomes. No numerical data were reported in the publication or obtainable
Other bias	Low risk	No other sources of bias identified.

Hochberg 2001

Methods	RCT No blinding
Participants	**Details of sampling frame*** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 72 participants (72 wrists) Total n available for follow-up = 72 participants were available for follow-up (including 24 protocol violators) Total n analysed = 48 participants (48 wrists) (12 participants were excluded from each group) Intervention group 1 n = 36 participants; 24 participants analysed Intervention group 2 n = 36 participants; 24 participants analysed **Gender distribution** 46 males; 26 females **Mean ± SD (range) age** 69% of participants under 45 years (no descriptive statistics reported) **Mean ± SD (range) duration of symptoms** Not reported **Inclusion criteria** Patients diagnosed with CTS and scheduled to undergo single open CTR following failed conservative management **Exclusion criteria** 1. Rheumatoid arthritis

	2. Diabetes 3. Bone fractures in wrist 4. Undergoing revision CTR **CTS diagnostic criteria (case definition)** 1. Electromyographic findings, nerve conduction velocity study findings, and clinical examination 2. Positive Tinel's and Phalen's signs 3. Sensory deficits in the median nerve distribution **Details of surgical intervention** 1. Simple open surgical decompression performed by author (also assessor) 2. Same procedure for all participants (incision started proximally at the distal flexion crease of the wrist distally toward the base of the 4th finger stopping 1 cm proximal to the distal palmar flexion crease (approximately 6 cm in length) **Symptom severity** Not reported
Interventions	**Intervention group 1: controlled cold therapy (and narcotic use)** Participants applied controlled cold therapy (CCT) to their affected hand or wrist continuously for 12 hours per day, immediately post surgery, until 3 days postoperatively. Expected daily exposure to treatment was 720 minutes. A thermostatically controlled cooling blanket (maintained at 7.2°C) was used to deliver the cold therapy directly over the volar surface of the surgical dressings using a Temptek T-1000 device **Intervention group 2: ice therapy (and narcotic use)** Participants applied a commercially available ice pack over the volar surface of their surgical dressings immediately after surgery. On return home, participants used a conventional ice bag (plastic bag with ice cubes) to deliver ice therapy to their affected hand or wrist when the cold pack lost its effectiveness. Ice therapy was applied in 12-hour periods, beginning immediately after surgery, until 3 days postoperatively. Expected daily exposure to treatment was 360 min. Participants were asked to alternate ice applications with no ice at 20-min intervals, for a total of 12 h per day Participants in both groups were provided with external immobilization and a surgical dressing less than 3 mm thick. The CCT device or ice was placed directly over the dressing on the dorsal aspect of the hand. Participants in both groups were given 28 hydrocodone + acetaminophen tablets on the day of surgery to take as required for pain relief
Outcomes	Outcomes assessed preoperatively, immediately postoperatively and 3 days after operation: 1. Swelling: measured wrist circumference at distal wrist crease (in cm) immediately postoperatively and at 3 days postoperatively 2. Intensity of pain severity using a 10 cm VAS preoperatively and postoperatively 3. Narcotic usage** measured using participants logbook recording of daily usage and number of tablets remaining at end of trial
Notes	*Quote: "All patients presenting with carpal tunnel syndrome who were to undergo single open surgical procedures were eligible for participation in the study." Comment: This suggests that treatment was only administered to 1 hand per participant so a unit of analysis error is unlikely **This outcome was not specified in our review so data were not entered for statistical

Hochberg 2001 (*Continued*)

	analysis Attempts to contact the trial authors for missing or unclear data were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Treatment assignment was based on a computer-generated randomisation list ensuring equal, unbiased distribution of patients into each group." Comment: The sequence generation was probably adequate
Allocation concealment (selection bias)	Unclear risk	Quote: "Treatment assignment was based on a computer-generated randomisation list ensuring equal, unbiased distribution of patients into each group." Comment: Not enough information to determine whether allocation concealment was adequate
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Not reported, but due to the nature of the interventions, it is unlikely that participants were blinded to the intervention they received
Blinding (performance bias and detection bias) Other outcomes	High risk	Quote: "All measures were recorded by an unblinded observer. " Comment: Outcome assessor was not blind to treatment allocation
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "Prior to the performance of any analysis, 24 patients were excluded, 12 in each group. Reasons for exclusions are presented in Table 1." Comment: Exclusions were clearly reported, and there was an identical number of exclusions per group, and these are unlikely to have biased the estimate of effect size. The number of participants included in the analysis of each outcome was clearly reported in the tables of results. Intention-to-treat analyses were performed on and reported for pain and swelling (wrist circumference) outcomes
Selective reporting (reporting bias)	Low risk	Comment: All outcomes specified in the methods of the publication were reported in the results section in pre-specified way
Other bias	Low risk	No other sources of bias identified.

Huemer 2007

Methods	Quasi-RCT
Participants	**Details of sampling frame*** Total n eligible = not reported* Total n excluded pre-randomisation = not reported Total n randomised = 50 participants (50 wrists)

	Total n available for follow-up = 50 participants (50 wrists) Total n analysed = 50 participants (50 wrists) Intervention group 1, n = 25 Intervention group 2, n = 25 **Gender distribution** Not reported **Mean ± SD (range) age** Not reported **Mean ± SD (range) duration of symptoms** Not reported **Inclusion criteria** Diagnosis of isolated, idiopathic CTS No exclusion criteria specified **CTS diagnostic criteria (case definition)** Diagnosis of isolated, idiopathic CTS was based on a history of sensory disturbances along the distribution of the median nerve with dysaesthesia and pain and an abnormal electrodiagnostic study according to published practice parameters for electrodiagnosis of CTS, including distal motor latencies (conduction distance 6.5 cm; abnormal value > 4.5 ms) and median sensory conduction velocity (between wrist and index finger; abnormal value < 46 m/s) **Details of surgical intervention** 1. Open CTR under general or regional anaesthesia (depending on the participant's choice) and tourniquet control 2. Curved incision made in the thenar crease and deepened through subcutaneous fat and palmar aponeurosis down to the transverse carpal ligament 3. Ligament transected on the ulnar side while the median nerve was directly visible **Symptom severity** Not reported
Interventions	**Group 1:** a bulky dressing with a volar splint was left in place for 48 hours with the wrist in neutral position **Group 2:** a light bandage was worn for 48 hours
Outcomes	Outcomes were assessed preoperatively and at 3 months' follow-up and included: 1. Pain using a VAS. The authors do not report measurement units, but judging from the results in Table 1 pg 529, it is assumed that a 0 to 10 VAS scale was used. Pain was measured pre-operatively, at the end of the 2-day treatment period, and at 3 months' follow-up 2. Two-point discrimination: reported in mm** 3. The Moberg pick-up test (measured in s)** 4. Grip strength (in kg) using a baseline hydraulic hand dynamometer (Fabrication Enterprises, WhitePlains, New York)** 5. Nerve conduction: distal motor latency (ms)** 6. Scar tenderness: divided into no perceptible pain, pain during active motion, and pain even at rest, and assessed at the 3-month follow-up***
Notes	*Quote: "All patients who presented to our department with isolated, idiopathic CTS between January and May 2006 were included in this study." Comment: This indicates that each participant contributed only 1 wrist to the study and thus, a unit of analysis

	error has not occurred **Measures of variability (SDs) for outcome measures were not reported ***The authors do not report which instrument was used to measure this outcome, nor do they provide an accompanying citation. Attempts to contact trial authors for incomplete or unclear data were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "The randomisation was accomplished by applying a volar splint to every even numbered patient in the consecutive list of 50 patients in this study." Comment: A non-random process was used to generate the allocation sequence
Allocation concealment (selection bias)	High risk	Quote: "The randomisation was accomplished by applying a volar splint to every even numbered patient in the consecutive list of 50 patients in this study." Comment: An alternating sequence generation was used, so investigators enrolling participants could possibly foresee interventions, introducing the potential for selection bias
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Not reported, but due to the nature of the interventions (light bandage versus splint), participant blinding unlikely
Blinding (performance bias and detection bias) Other outcomes	Unclear risk	Comment: Insufficient information.
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "All recruited patients completed the study with no drop-outs in either group." Comment: The reported data are likely to be based on a complete sample
Selective reporting (reporting bias)	High risk	Quote: "After carpal tunnel release, all patients reported almost complete resolution of their symptoms, which consisted of numbness, especially at night, as well as pain and tingling. " Comment: The authors do not report how these symptoms were measured. Only mean scores (no SDs or 95% CIs) are reported for all of the outcomes, and outcomes are reported in terms of being "significantly different" between the time points or between groups, but no P values are reported
Other bias	Low risk	No other sources of bias identified.

Janssen 2009

Methods	Double-blind RCT Blinded participants and outcome assessors
Participants	**Details of sampling frame*** Total n eligible = 58 participants (58 wrists) Total n excluded pre-randomisation = 0 participants Total n randomised = 58 participants (58 wrists) Total n available for follow-up = 56 participants (56 wrists) Total n analysed = 56 participants (56 wrists) Intervention group 1, n = 19 participants completed Intervention group 2, n = 23 participants completed Intervention group 3, n = 14 participants completed **Gender distribution**** Group specific gender distribution not reported Total randomised: 22 males; 36 females* **Mean ± SD (range) age**** Group specific data not reported Total randomised: 51.5 (SD and range not reported) **Mean ± SD (range) duration of CTS symptoms**** Not reported **Inclusion criteria** 1. Diagnosis of CTS based on clinical examination and electromyographic testing 2. Aged over 21 years **Exclusion criteria** 1. Concurrent hand conditions 2. Systemic or neurological conditions 3. Revisions of previous CTR **CTS diagnostic criteria (case definition)** Clinical examination and electromyographic testing **Details of surgical intervention** Open CTR **Symptom severity**** Not reported
Interventions	**Group 1: contrast baths plus exercise** Involved hand was placed in hot water up to the proximal wrist crease and the participant immediately began by doing 10 gentle, pain free, deliberate composite fists; one every 6 s. The exercises were then immediately replicated in cold water and participants continued this process of shifting the hand back and forth between the hot and cold baths for a total of 11 min **Group 2: contrast baths without exercise** Involved hand was placed in hot water up to the proximal wrist crease for 1 min, followed by immersion in cold water in the same position for 1 min. The hand was shifted back and forth between hot and cold baths for a total of 11 min **Group 3: exercises only** The participant performed 10 gentle, pain free, deliberate composite fists; one every 6 s. The participant paused for 4 s after each 10 repetitions, and continued this process for a total 11 min

Outcomes	Outcome assessed immediately after treatment before open CTR and after treatment delivered 10 to 14 days post-CTR 1. Hand volume measured by the water displacement technique using a standard hand volumeter and recording the amount of water displaced in ml
Notes	* Only 1 affected hand per participant was evaluated in this study, so a unit of analysis error resulting from the correlation between 2 wrists in bilateral CTS participants could not have occurred **Authors contacted for clarification of unclear or unreported items. Unpublished data received from personal communication from the authors Participants received the interventions before and after open carpal tunnel surgery; the data included in this review only pertains to the evaluation after surgery

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "The subjects were assigned to the different treatment groups by random assignment with replacement-each subject picked one of three different coloured cubes from a cloth bag. The cubes were then returned to the bag so that subsequent participants had an equal chance of picking from all three coloured cubes." Comment: The random allocation sequence was probably adequately generated
Allocation concealment (selection bias)	Unclear risk	Quote: "The subjects were assigned to the different treatment groups by random assignment with replacement-each subject picked one of three different coloured cubes from a cloth bag. The cubes were then returned to the bag so that subsequent participants had an equal chance of picking from all three coloured cubes." Quote (unpublished data): "Randomisation into the groups was concealed from the evaluator by a separate team member." * Comment: Not enough information to determine whether the allocation sequence was adequately concealed
Blinding (performance bias and detection bias) Self reported outcomes	Low risk	Quote: "The subjects were blinded to group assignment and knew only that they were receiving a treatment." Comment: Participants was probably blind

		to treatment allocation
Blinding (performance bias and detection bias) Other outcomes	Low risk	Quote: "All evaluations were conducted by two certified hand therapists (RGJ, DAS). The evaluating therapist was blinded to the specific treatment group for each subject." Comment: Outcome assessors were probably blind to treatment allocation
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "The pre-surgery subjects were divided as follows-Treatment Group 1: Contrast Baths with Exercise had 18 participants, Treatment Group 2: Contrast Baths without Exercise had 22 participants, and Treatment Group 3: Exercise Alone had 18 participants. Eight subjects studied preoperatively were unavailable for postoperative data collection and dropped out of the study. Reasons cited by subjects for dropping out of the study included the amount of time it took for the evaluation and treatment, and/or rescheduling of follow-up surgeon visits without rescheduling of therapy follow-up visits. Fifty subjects continued with the study after their surgery. Six additional subjects were recruited for data collection after CTR surgery, although they did not participate before surgery. A total of 56 subjects were thus treated and evaluated for the study post-surgery. The post surgery subjects were divided as follows-Treatment Group 1: Contrast Baths with Exercise had 19 participants, Treatment Group 2: Contrast Baths without Exercise had 23 participants, and Treatment Group 3: Exercise Alone had 14 participants". Comment: Numbers of drop-outs and reasons for withdrawals were reported, and unlikely to have an impact on the results
Selective reporting (reporting bias)	Low risk	Comment: The outcomes for this study were fully reported in the results section of the publication
Other bias	Low risk	No other sources of bias identified.

Jeffrey 2002

Methods	Randomised, double-blind placebo-controlled trial Blinded participants and assessors
Participants	**Details of sampling frame** Total n eligible = not reported* Total n excluded pre-randomisation = not reported* Total n randomised = 40 participants (80 wrists)** Total n available for follow-up = not reported* Total n analysed = 37 participants (74 wrists)** Intervention group 1, n = 20 participants (40 hands)** Intervention group 2, n = 17 participants (34 hands)** **Gender distribution** Intervention group: 12 males; 8 females Placebo group: 6 males; 11 females **Mean ± SD (range) age** Intervention group 1: 51 years ± 14 years** Intervention group 2: 55 years ± 19 years** **Mean ± SD (range) duration of symptoms*** Not reported **Inclusion criteria** 1. Patients who had undergone bilateral endoscopic CTRs **Exclusion criteria** 1. Aged under 16 years 2. Pregnancy or breastfeeding 3. Conversion to "open" CTR technique 4. Allergy to arnica, lanolin or beeswax **CTS diagnostic criteria (case definition)*** Not reported **Surgical details** • Single portal endoscopic CTR performed by the senior author under either local or general anaesthesia, under tourniquet control, and after standard skin preparation • Technique was a modified Agee single-portal approach using a radially based V-shaped incision made just ulnar to the palmaris longus tendon at the distal wrist crease **Symptom severity*** Not reported
Interventions	**Group 1: arnica** Three arnica D6 tablets 3 times daily (total 9 tablets per day) from the day of surgery for 2 weeks, plus application and gentle massage with arnica ointment 3 times daily around (but not in) the wound and on the front of the wrist after removal of the dressing 72 hours post surgery, for 2 weeks **Group 2: placebo** Placebo (not specified by the authors, so it is assumed that 3 placebo tablets were taken 3 times daily and placebo ointment was applied 3 times daily for 2 weeks) Following surgery, participants in both groups received a bulky dressing, free fingers and thumb to allow mobility. No splint was used. Participants were given an exercises sheet. Dressing removed at 3 days and sutures removed after 1 week. Participants routinely discharged after 2 weeks

Outcomes	Outcomes assessed preoperatively, and 1 and 2 weeks after surgery. 1. Grip strength using a Jamar dynamometer set at the third position. Results at 1 and 2 weeks were expressed as a percentage of the pre-surgery measurement 2. Wrist circumference measured at the distal wrist crease. The 1- and 2-week measurements were expressed as a percentage change from the pre-surgical measurement 3. Pain measured as the degree of pain resulting from surgery during the previous 7 days, using a linear VAS ranging from 'no pain' to 'terrible', which the authors converted to a 0 to 10 scale*** 4. Adverse events such as allergy or infection were noted by the authors (not reported how this data was collected)
Notes	*Attempts to contact trial authors for further clarification of unclear or incomplete data were unsuccessful **Data only reported for participants completing treatment (n = 37) ***Only mean was reported numerically (SD presented graphically) Quote: "All patients who received bilateral endoscopic carpal tunnel releases (ECTRs) performed by the senior author between June 1998 and January 2000 were considered for this study." Quote: "The results are presented as the mean of both sides at each time interval." Comment: This suggests that the data are based on the number of participants, not the number of independent wrists, so a unit of analysis error is unlikely

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "The Arnica and placebo preparations were formulated by Weleda Ltd, a licensed UK manufacturer, which also performed the randomisation." Comment: Insufficient information
Allocation concealment (selection bias)	Low risk	Quote: "The Arnica and placebo preparations were formulated by Weleda Ltd, a licensed UK manufacturer, which also performed the randomisation." Comment: The allocation sequence was probably adequately concealed until interventions were assigned
Blinding (performance bias and detection bias) Self reported outcomes	Low risk	Quote: "Double-blind, randomised comparison of Arnica administrations versus placebo." Quote: "The placebo and active preparations looked exactly the same? " Comment: Participants were probably blind to treatment allocation

Jeffrey 2002 (*Continued*)

Blinding (performance bias and detection bias) Other outcomes	Low risk	Quote: "After gathering the data, the authors were provided with the allocations of patients into two groups so we could perform the data analysis. Only after the data analysis was complete were we informed which group received placebo and which received Arnica." Comment: Outcome assessors were probably blind to treatment allocation
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "Forty patients were entered into the trial. Three patients were excluded because of conversion to an "open release on one or both sides. Twenty patients were in the arnica group and 17 were in the placebo group." Comment: The authors did not specify how many participants were randomly allocated to each group, but the exclusion of three participants is probably unlikely to have resulted in a significant bias in the outcomes reported
Selective reporting (reporting bias)	Low risk	Comment: All outcomes specified in the methods section of the publications were reported in the pre-specified way
Other bias	Low risk	No other sources of bias identified.

Li 2008

Methods	RCT No blinding
Participants	**Details of sampling frame** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 124 participants (75 CTS participants) Total n available for follow-up = 124 participants (75 CTS participants) Total n analysed = 124 participants (75 CTS participants) Intervention group 1 n = 31 participants randomised (18 of whom had median nerve entrapment syndrome) Intervention group 2 n = 31 randomised (21 of whom had median nerve entrapment syndrome) Intervention group 3 n = 31 randomised (17 of whom had median nerve entrapment syndrome) Control group 4 n = 31 randomised (19 of whom had median nerve entrapment syndrome) **Gender distribution**

	(All participants: gender of CTS participants not reported separately) Group 1: 13 males; 18 females Group 2: 11 males; 20 females Group 3: 9 males; 22 females Group 4: 8 males; 23 females **Mean ± SD (range) age** (All participants: age of CTS participants not reported separately. Mean and SD not reported) Group 1: range 23 to 61 yrs Group 2: range 25 to 59 yrs Group 3: range 26 to 57 yrs Group 4: range 28 to 56 yrs **Mean ± SD (range) duration of CTS symptoms** Not reported **Inclusion criteria** All participants met the diagnostic standard of peripheral nerve entrapment syndrome defined by Doctor Chen in 1995 (Li 2008). Diagnostic criteria: (1) paraesthesia in the region dominated by the entrapped nerve, such as pain numbness and malaise, alternation between mild and severe levels, gradual aggravation, as well as pain and aggravation at night; (2) sensitization or degeneration of sensory functions, or even sensory deprivation in regions dominated by the injured nerve; (3) tender points, strand-like tender masses or Tinel syndrome at entrapped sites to irritate the most sensitive regions; (4) amyotrophy, weakness, or reduced muscle force and disturbed motor coordination in nerve-dominated regions. **Exclusion criteria** Not reported **CTS diagnostic criteria (case definition)** See inclusion criteria **Details of surgery** Not reported
Interventions	**Intervention group 1: electrical stimulation** Multi-form wave therapeutic equipment used to treat patients in the electrical stimulation group after neurolysis. Wave form, stimulus width, interval time, and stimulus intensity were regulated based on the grade of nerve injury. The details were as follows: mild nerve injury: 50 to 100 ms stimulus width and 1500 to 2000 ms intervals; moderate nerve injury: 100 to 200 ms stimulus width and 3000 to 4000 ms intervals; severe nerve injury: 200 to 300 ms stimulus width and 3000 to 6000 ms intervals. Current dosage was 20 to 40 mA. The electrical stimulation was given for 6 min/session, once a day, and 20 days were regarded as 1 treatment cycle. Inter-cycle intervals were 10 days, and the treatment was performed for 3 successive months **Intervention group 2: decimeter wave therapy** A TMA-A double-frequent mild-hot therapeutic instrument was used on participants in the decimeter wave group after neurolysis. The therapeutic program was adapted to the early and middle-late phase. In the early phase, the decimeter wave was 10 to 15 W, 10 min/session once a day; in the middle-late phase, the decimeter wave was 10 to 30 W, 20 min/session, once a day. Twenty days were regarded as 1 treatment cycle. Inter-cycle intervals were 10 days, and the treatment was performed for 3 successive months **Intervention group 3: compound physical factor treatment (electrical stimulation**

	and decimeter wave therapy combined) Participants in the compound physical factor group following neurolysis were treated the same as the decimeter wave group and electrical stimulation group, respectively. The treatment was performed once a day, and 20 days were regarded as 1 course. Inter-cycle intervals were 10 days, and the treatment was performed for 3 successive months **Control group 4: no physical treatment**
Outcomes	Outcomes assessed at 1, 2 and 3 months post surgery (3 months post surgery, equal to end of 3 months' treatment) 1. Change in electromyogram results* (Excellent efficacy: M5, M4, S4, S3, generally normal electromyogram; good efficacy: M3, S3, mostly recovered electromyogram; passable efficacy: M2, S2, slightly recovered electromyogram; poor efficacy: M1, M0, S1, S0, no recovery in the electromyogram. Grades set by the Subassociation of Hand Surgery, Chinese Medical Association)
Notes	*This outcome was not included in our review and thus, data were not included in our statistical analysis *As this publication reports the results of rehabilitation following a mixture of nerve entrapment surgeries, and it is not clear whether participants offered more than 1 hand, a unit of analysis error may have occurred. Attempts to contact the authors to obtain this information and CTS-specific data including incomplete or unclear data were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "All patients were randomly divided into four groups: electrical stimulation group, decimeter wave group, compound physical factor group, and control group, with 31 subjects in each group." Comment: No information on allocation sequence generation was reported
Allocation concealment (selection bias)	Unclear risk	Quote: "All patients were randomly divided into four groups: electrical stimulation group, decimeter wave group, compound physical factor group, and control group, with 31 subjects in each group." Comment: No information on allocation sequence concealment was reported
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Blinding of participants and personnel not reported, but given the nature of the intervention, it is unlikely that participant blinding occurred
Blinding (performance bias and detection bias) Other outcomes	Unclear risk	Comment: Blinding of outcome assessors not reported; however, this may have occurred

Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "All initially recruited 124 patients with peripheral nerve entrapment syndrome were included in the final analysis." Comment: All participants randomised were analysed; no attrition/exclusions reported
Incomplete outcome data (attrition bias) After 12 weeks	High risk	Comment: Last outcome assessment was at the completion of the intervention period, at 3 months post operation
Selective reporting (reporting bias)	Low risk	Comment: All outcomes reported in the methods were reported in the results section of the publication
Other bias	Low risk	No other sources of bias identified.

Martins 2006

Methods	Single-blind quasi-RCT Blinded assessors
Participants	**Details of sampling frame*** ** Total n eligible = 52 participants Total n excluded pre-randomisation = 1 participant Total n randomised = 51 participants (53 wrists) Total n available for follow-up = 50 participants (52 wrists) (1 participant excluded after randomisation) Total n analysed = 50 participants (52 wrists) From the 7 participants who had bilateral involvement and underwent surgical procedures at separate times for each wrist, only 2 of these were included in the study for analysis (and 5 were not included in the analysis)* Intervention group 1, n = 25 participants (26 wrists) commenced study; 25 participants (26 wrists) completed study Intervention group 2, n = 26 participants (27 wrists) commenced study; 25 participants (26 wrists) completed study **Gender distribution*** Group 1: 3 male; 23 female (this data includes the excluded participants) Group 2: 3 male; 23 female (this data includes the excluded participants) Total sample distribution: 6 males, 46 females **Mean age ± SD (range)*** Group 1: 47.8 years ± 11.5 years (26 to 74 years) Group 2: 51.7 years ± 6.8 years (39 to 64 years) Total sample: 49.8 years (26 to 74 yrs) **Mean ± SD (range) duration of CTS symptoms*** Group 1: 29.5 months ± 27.5 months (6 to 96 months) Group 2: 29.2 months ± 23.1 months (8 to 72 months) Total sample: 29.31 (6 to 72) months **Inclusion criteria** 1. Diagnosis of idiopathic CTS 2. All participants had to have received conservative management prior to surgery consisting of wrist splinting at neutral wrist angle and use of non-steroidal anti-

	inflammatory drugs if pain was the symptom for 6 weeks. **Exclusion criteria** 1. Inability to complete a self administered questionnaire 2. Previous CTR 3. Occurrence of medical conditions associated with increased incidence of CTS like diabetes mellitus and hypothyroidism 4. Wrist trauma or surgery 5. Musculoskeletal, metabolic or autoimmune disorders 6. Presence of space-occupying lesions at the wrist, identified before surgery or at intra-operative period 7. Pregnancy **CTS diagnostic criteria (case definition)** Based on symptoms and findings on physical examination. Clinical examination included the presence of typical sensory symptoms, Tinel sign, Phalen's and Durkan's tests, sensory testing by 2-point discrimination, muscle testing and examination of thenar atrophy. All patients had electrophysiological confirmation of CTS **Details of surgical intervention** • Open CTR without upper-arm tourniquet, under local anaesthesia by the senior author • Standard 3 cm incision made in the palm along a line projected proximally from the inter-space between the middle and ring finger, paralleling the thenar crease without transgressing the wrist flexion crease • Neither epineurotomy nor internal neurolysis were performed • All participants had six weeks of conservative management (splinting and non-steriodal anti-inflammatory drugs for pain) prior to surgery Seven patients had bilateral involvement and underwent surgical procedures on separate intervals for each hand **Symptom severity** Not reported
Interventions	**Group 1:** Wrist immobilisation using a splint in the neutral position for 2 weeks post surgery **Group 2:** No splint was worn and participants were encouraged to move their hands and fingers freely No other treatment, including anti-inflammatory drugs used in either group All participants received the same immediate postoperative care. Each wrist was immobilized in a soft dressing and light compressive bandage for 48 hours and after that, 2 groups were formed according to the treatment adopted
Outcomes	Outcome assessments were performed pre-operatively and 14 days postoperatively 1. BCTQ Symptom Severity Score a self reported questionnaire designed to evaluate the outcome specifically in CTS and has been found to be reproducible, internally consistent and responsive to clinical change. In the first section of this scale, the symptom score is determined from 11 questions regarding different attributes of pain, tingling and numbness with each answer scoring between 1 (no symptom) and 5 (very severe symptoms). Questionnaire was translated to Portugese*** 2. Symptom intensity was measured using the Symptoms Intensity Scale: the intensity of symptoms (tingling, burning pain and numbness) was rated by each participant on an interval scale from 0 to 4, with zero indicating "no symptom" and 4

	indicating "intolerable symptom". A translated Portugese version of the assessment was used***; 3. Static 2-point discrimination was measured using a 2-point discriminator (North Coast Medical Inc., California, USA) applied to palmar surface of the second finger distal phalange****.
Notes	*Data obtained from personal communication with authors. **Quote: "Seven patients had bilateral involvement and underwent surgical procedures on separate time for each hand." Quote: "Randomisation of the wrists was used in this study." Quote: "Each wrist was considered as an independent variable." Comment: Outcomes reported are based on the number of wrists, thus a unit of analysis error is likely to have occurred *** Results were expressed as the mean total score for the answered questions, and as a symptom severity/intensity index, calculated as "preoperative value - postoperative value/ preoperative value" **** Results were expressed as the mean score in mm, and as a discrimination index, calculated as "preoperative value - postoperative value/preoperative value"

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Quote: "Fifty two patients with idiopathic carpal tunnel syndrome were randomly selected in two groups after open carpal tunnel release." Quote (unpublished data) : "a simple randomisation was used. After surgery each patient was alternatively allocated within the treatment groups." Comment: The random sequence was not adequately generated
Allocation concealment (selection bias)	Unclear risk	Quote: "All patients received the same immediate postoperative care. Each wrist was immobilized in a soft dressing and light compressive bandage for 48 hours and, after that, two groups with 26 patients were formed according to the treatment adopted." Comment: Insufficient information
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Due to the nature of the interventions (splint vs no splint), blinding of participants or personnel unlikely
Blinding (performance bias and detection bias) Other outcomes	Low risk	Quote: "The evaluations were performed pre-operatively and repeated fourteen days after the surgery in a blind fashion." Quote (unpublished data): " Result were noted

		in protocol without information about the treatment method. The examiner had access to the protocol that did not report the method of treatment. All postoperative follow-up physical examinations were completed by one examiner who did not participate in the surgery and who had no knowledge of group assignments. However he could obtain information about treatment by questioning patients." Comment: Outcome assessors were probably blind to treatment allocation
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "Fifty-two patients fulfilled the inclusion criteria during the study period. We had two exclusions in this study, one patient with classical symptoms who presented with a persistent median artery with large diameter at surgery and a patient who presented postoperative wound infection." Quote (unpublished data): "From the patients who had bilateral carpal tunnel syndrome, only two of the wrists were included in this study" and "One was excluded before randomisation, and had an anatomical variation observed during surgery (a large median artery), and the other was excluded after randomisation when a wound infection was detected." Comment: Incomplete outcome data appears to have been adequately addressed
Selective reporting (reporting bias)	Low risk	Comment: All outcomes specified in the methods section of the publication were reported in the pre-specified way
Other bias	Low risk	No other sources of bias identified.

Pomerance 2007

Methods	Single-blind RCT Blinded assessors
Participants	**Details of sampling frame*** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 150 participants (150 wrists) Total n available for follow-up = 150 participants (150 wrists) Total n analysed = 150 participants (150 wrists)

	Intervention group 1, n = 73 Intervention group 2, n = 77 **Gender distribution** Gender distribution not clearly reported. **Mean ± SD (range) age** Intervention group 1: 47 years (no measures of variability reported) Control group 2: 45 years (no measures of variability reported) **Inclusion criteria** 1. Patients with CTS (positive clinical evaluation and nerve conduction study) booked for surgery 2. Patient employed at the time of surgery **Exclusion criteria** 1. Cervical pathology 2. Lack of clinical signs of advanced disease (atrophy of thenar muscles, dense anaesthesia in the median innervated digits) 3. Prior surgery on the hand or wrist 4. Arthritis of the hand or wrist 5. Prior or concurrent history of endocrine disorders (diabetes, thyroid disorders) **CTS diagnostic criteria (case definition)** 1. Clinical evaluation (pain and paraesthesia in the hand primarily the radial digits, awakening at night due to hand pain and numbness, positive timed Phalen's or carpal compression test) 2. Nerve conduction study confirming the diagnosis of CTS **Details of surgical intervention** 1. Minimal incision open CTR as described by Bromley 1994 was used in all patients (Bromley 1994). 2. No tenosynovectomy, epineurotomy, or neurolysis was performed in any participant **Symptom severity** Advanced carpal tunnel (as identified and described in the study inclusion and exclusion criteria)
Interventions	**Intervention group 1: formal therapy program for 2 weeks post operation** Two-week formal therapy exercise program of six sessions (nerve gliding exercises, range of motion, and strengthening). Each therapy session was approximately 30 min with a certified hand therapist along with any additional treatments (massage, fluidotherapy etc) used at each session. Participants were also encouraged to use the hands for activities of daily living, and encouraged to increase hand use. **Control group 2: no formal therapy program** No formal therapy program was provided by a hand therapist, but participants were advised to avoid direct pressure over the incision and encouraged to use the hands for activities of daily living, and increase hand use Both groups were instructed pre-operatively that there would be no restrictions to motion of the operated hand and wrist and no splints would be used after surgery, and were instructed in differential tendon gliding exercises and scar massage. Return to their desired activity or work was discussed with all patients pre-operatively and timing was based on job duties. They were all allowed to be off work until the first postoperative visit (5 to 7 days). At that visit, return to work was allowed in all participants; job modifications, if any, were based on upper extremity requirements. Participants were

	allowed to return to modified activity avoiding any forceful gripping or direct pressure over the incision site. They were advanced to full activities or work during subsequent visits unless there were complications from the surgery. In participants who did not have the option of modified duty due to the policy of the employer, they were off work until their symptoms and clinical evaluation allowed unrestricted work Following the surgery, participants in both groups were instructed that they could remove the dressing the following day if desired and shower, replacing the postoperative dressing with a standard adhesive strip. They were advised to avoid direct pressure over the incision and to keep the incision clean. Sutures were removed at the first postoperative visit (5 to 7 days), and participants encouraged to use their hand for activities of daily living, and to increase hand use.
Outcomes	1. Return to work dates were recorded for both modified and regular duty. Results were reported as the number of participants returning to work at certain dates, categorised by insurance status (Medicare, commercial, or workers' compensation). Assessed at 2, 4, and 6 weeks and 3 and 6 months post-surgery; 2. Pain using an analogue 10-point pain scale ranging from 0 = no pain to 10 = severe pain. Assessed preoperatively and postoperatively** 3. Lateral pinch strength (kg) using a Preston pinch gauge (JA Preston Corporation, Clifton, NJ). Assessed preoperatively and at 2, 4, and 6 weeks and 3 and 6 months post-surgery 4. Grip strength (kg) using a dynamometer at position II as described by Mathiowietz et al (Asimov Engineering Corporation, Los Angeles, CA). Assessed preoperatively and at 2, 4, and 6 weeks and 3 and 6 months post-surgery 5. Disability using the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire. This outcome was only measured at the final post-operative visit (6 months post-surgery) 6. Persistence of symptoms (participants were questioned for persistence of nocturnal symptoms, paraesthesias, and incision difficulties) 7. Complication (wound dehiscence) 8. Economic evaluation (cost of care comparison between groups)***
Notes	*Quote: "No bilateral surgeries were performed." Comment: It can be assumed that each participant contributed 1 wrist to the analysis, so a unit of analysis error is unlikely *The authors did not report how these data were recorded or at what times points measured ***This outcome was not specified in this review and hence, data were not entered into RevMan for analysis Attempts to contact trial authors of clarification of incomplete or unclear data were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Once patients met the entry criteria, they were then randomised into 1 of 2 groups by having a staff member not involved in the study blindly draw a paper from a box. The box had

		equal numbers of marked and unmarked papers. Those with a mark were randomised to a 2-week course of therapy...The patients with unmarked papers were randomised to a group without formal therapy." Comment: The allocation sequence was probably adequately generated
Allocation concealment (selection bias)	Low risk	Quote: "Once patients met the entry criteria, they were then randomised into 1 of 2 groups by having a staff member not involved in the study blindly draw a paper from a box. The box had equal numbers of marked and unmarked papers. Those with a mark were randomised to a 2-week course of therapy...The patients with unmarked papers were randomised to a group without formal therapy." Comment: The allocation sequence was probably adequately concealed until interventions were assigned
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Not reported, but due to the nature of the interventions (therapists-guided exercises program versus instructions for home exercises only), it is unlikely that participants would have been blind to treatment allocation
Blinding (performance bias and detection bias) Other outcomes	Low risk	Quote: "At each office visit, clinical evaluation was completed by staff blinded to whether or not the patient was in formal therapy." Comment: Outcome assessors were probably blind to treatment allocation
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "No patients were lost to follow-up, and none crossed over between groups." Comment: The data set was probably complete as there were no withdrawals throughout the study period
Incomplete outcome data (attrition bias) After 12 weeks	Low risk	Quote: "No patients were lost to follow-up, and none crossed over between groups." Comment: The data set was probably complete as there were no withdrawals throughout the study period
Selective reporting (reporting bias)	High risk	Comment: The majority of the outcomes specified in the methods section were reported in the pre-specified way (Grip strength, Pinch strength, Disability using the DASH questionnaire). However, pre- and postoperative pain was not reported separately per group (only the mean score for the combined sample at these time points was reported). Recurrence of symptoms was not re-

		ported at all.
Other bias	Low risk	No other sources of bias identified.

Powell 2003

Methods	Double-blind RCT Blinded assessors and participants
Participants	**Details of sampling frame*** Total n eligible = 40 participants (40 wrists) Total n excluded pre-randomisation = 11 participants (11 wrists) Total n randomised = 29 participants (29 wrists) Total n available for follow-up = 27 participants (27 wrists) Total n analysed = 27 participants (27 wrists) Intervention group 1, n = 13 Control group 2, n = 14 **Gender distribution** No group-specific data reported Total sample: 5 males; 22 females **Mean ± SD (range) age** 53 years (33 to 83 years) Group 1: 48.5 years (33 to 83) Group 2: 54.5 years (34 to 80) **Median duration of CTS symptoms** No group-specific data reported. Total sample: 2 years (1 to 10 years) **Inclusion criteria** 1. Patients listed for CTR from the surgical waiting lists at the research centre 2. Males and females aged 18 to 85 years with simple, idiopathic CTS **Exclusion criteria** None, although it was planned that subjects who developed complications would be withdrawn to initiate appropriate therapy **CTS diagnostic criteria (case definition)** Diagnosed by clinical examination by consultant surgeon **Details of surgical intervention** • Open CTR • All operations were carried out under local anaesthetic using a tourniquet • A longitudinal incision was made at the site of the transverse carpal ligament, using the radial border of the 4^{th} finger as a guide and the TCL was released. The incision did not cross the wrist crease No bilateral operations performed **Symptom severity** Not reported
Interventions	All participants received a postoperative bulky dressing which was reduced to a smaller dressing by the participant at 48 hours to enable gentle active mobilisation of the hand. All participants were given standard postoperative instructions which included advice on elevation to minimise oedema, gentle active mobilisation of the hand, and to avoid

	heavy activities Sutures were removed at 14 days by a wound nurse to standardise suture removal and wound management. A light dressing was applied to the wound site, and participants were asked to keep the scar covered until their next review. The nature of CTS, and the CTR were discussed with each participant, and general advice given regarding their likely return to function based on recent research evidence and clinical experience. Interventions were assigned to each group at a hand therapy assessment 1 week later **Intervention group 1: desensitisation** Intervention group received a general hand exercise regime, and a desensitisation programme, which was demonstrated and advised by the occupational therapist. Participants were instructed to massage their scar tissue with a continuous, circular massage for 2 min, 5 times daily. They were then instructed to repeat the exercise using a rough towel, which was rubbed gently over the scar. All participants in the treatment group received a desensitisation programme advice sheet with specific instructions. This program was upgraded at 6 weeks and 3 months **Control group 2: Standard treatment control** Control group received a general hand exercise regime, and were advised to carry out 5 of each of the wrist and hand exercises 5 times daily. An advice sheet was given detailing the exercises, their intensity and regularity. Participants were advised to avoid heavy activities, such as ironing, carrying the shopping and contact sports.
Outcomes	Outcomes were assessed at baseline (3 weeks post-operation) and 6 weeks and 3 months post operation 1. Scar sensitivity (objective measure) using a Dolorimeter (hand held pressure gauge which when applied with a force provides a linear measure of the pressure/pain threshold in the scar tissue) 2. Discomfort (subjective measure) using a 10 cm VAS with equal intervals from 0 to 100 (0 = no pain at all; 100 = worst pain imaginable) 3. BCTQ Functional Status Scale was measured postoperatively. 4. Grip strength using a Jamar Dynamometer (kg) - mean of 3 repeated measures 5. Satisfaction measured on a 6-point scale. Patients were asked to chose from 1 of 4 options (strongly agree, agree, disagree, strongly disagree) in relation to a number of questions about the surgery. The scores were totaled for the Patient Satisfaction scale (range 8 to 24). A score of 8 indicated subjects were very dissatisfied with the surgery, 24 indicated that subjects were very satisfied with their outcome
Notes	All data reported from unpublished sources (unpublished Masters thesis and personal communication) *Quote: "Twenty three subjects had bilateral carpal tunnel symptoms, and seven of these had undergone a previous CTR on the opposite hand." Comment: Authors reported that no bilateral surgeries were performed. Hence, a unit of analysis error would not have occurred

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**

Random sequence generation (selection bias)	Low risk	Quote: "Simple random sampling using even and odd numbered raffle tickets was chosen to give an equal and random chance of selection to the treatment and control groups. At the start of the session, subjects were asked to randomly pick a raffle ticket from a bowl, and were allocated a group. Subjects with even numbered tickets were placed in the treatment group, odd numbers in the control group." Comment: The random sequence was adequately generated
Allocation concealment (selection bias)	Low risk	Quote: "Simple random sampling using even and odd numbered raffle tickets was chosen to give an equal and random chance of selection to the treatment and control groups. At the start of the session, subjects were asked to randomly pick a raffle ticket from a bowl, and were allocated a group. Subjects with even numbered tickets were placed in the treatment group, odd numbers in the control group." Comment: The intervention allocation was adequately concealed
Blinding (performance bias and detection bias) Self reported outcomes	Low risk	Quote: "Subjects who underwent operations on the same day were allocated review appointments at different times/days to minimise communication between control and treatment group subjects." Quote: "Patients were not advised which group they were in to maintain blinding. " Comment: Participants were probably blinded to whether they were in the intervention or the control group
Blinding (performance bias and detection bias) Other outcomes	Low risk	Quote: "At this stage, each subject was asked to attend a separate assessment booth set up by the OTT, for the subjective and objective assessments. The OTT was blinded to which group each subject belonged to avoid bias during assessments. " Comment: The outcome assessor was most probably blinded to intervention allocation of the participants. However, due to the nature of the intervention (desensitisation vs no desensitisation techniques) it would be unlikely that those administering

Powell 2003 (*Continued*)

		treatment were blinded to the intervention group
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: " Two male patients withdrew from the study at the six week stage. Their data was too small to be significant, therefore we removed for purposes of the analysis. " Comment: Withdrawals and how they were dealt with is clearly reported in the thesis
Selective reporting (reporting bias)	Low risk	Comment: All outcomes specified in the methods section of the publication were reported on in the pre-specified way
Other bias	Low risk	No other sources of bias identified.

Provinciali 2000

Methods	Single-blind quasi-RCT Blinded assessor
Participants	**Details of sampling frame*** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 100 participants Total n available for follow-up = not reported Total n analysed = not reported Intervention group 1, n = 50 Intervention group 2, n = 50 **Gender distribution** No group specific gender distributions reported. Total sample: 18 males; 82 females **Mean ± SD (range)age** 54.7 ± 12.4 yrs (range 24 to 86 yrs) Group 1: 57.4 yrs (range 24 to 86 yrs) Group 2: 55.5 yrs (range 29 to 79 yrs) **Mean ±SD (range) duration of symptoms** Not reported **Inclusion criteria** 1. Patients diagnosed with CTS scheduled for surgery No exclusion criteria specified **CTS diagnostic criteria (case definition)** 1. Clinical diagnosis using the criteria of the American Academy of Neurology, the American Association of Electrodiagnostic Medicine and Rehabilitation 2. Severity defined by electromyography-electroneurography according to the Mayo clinic criteria* **Surgical details**

	1. Open CTR 2. No details of surgery or comparability of procedures across groups presented **Symptom severity**** Mild (early) n = 0 Moderate (intermediate) n = 25 Severe (advanced) n = 75 Group 1: 11 moderate; 39 severe Group 2: 14 moderate; 36 severe
Interventions	**Intervention group 1: multimodal rehabilitation from 12 days postoperatively** Participants received 10 sessions of physiotherapy (of 1 hour duration) for 2 weeks starting at day 12 postoperatively. Treatment consisted of progressive stretching of the palmar fascia for soft tissue mobilization, progressive straightening exercises of abductor pollicis brevis and opponens pollicis, massage for softening the surgical scar, nerve gliding, grip and pinch exercises, motor dexterity exercises, sensory stimulation of the affected area of the hand and discriminative sensory re-education exercises. Participants were treated by the same physiotherapist. **Intervention group 2: progressive home exercise program** Participants were instructed in a progressive home exercise program designed to gradually increase strength and endurance. No splinting was used in these participants
Outcomes	Outcome assessed on the day of surgery, at day 12 postoperatively (prior to rehabilitation and at suture removal), 1 month and 2 months after surgery 1. Hand dexterity using the 9-hole peg test. This test measures the time to insert 9 pegs into 9 holes on a square board and then return the pegs to a container, one at a time*** 2. Objective hand function using the Jebsen-Taylor test. The time taken for participants to perform 7 standardized tasks (writing, turning over cards, picking up small common objects, simulated feeding, stacking checkers, picking up large light objects and picking up large heavy objects). The tasks are designed to simulate performance of some activities of daily living*** 3. BCTQ Symptoms Severity Score. This questionnaire requires participants to rate their symptoms in 11 questions with responses ranging from 1 (no symptoms) to 5 (very severe symptoms). The developers of this test recommend taking an average of the responses across the 11 items to produce a total score. However, the authors of the current trial only reported the summed scores across participants for items 1 to 10 (with no measures of variability)*** 4. Time taken to return to work for non-compensable participants (days from the date of operation to return to full work activities). Participants with workers' compensation cases were excluded (however, N not reported)****
Notes	* Some of the participants underwent bilateral surgery. It is unclear how many wrists in total were included in the study and therefore the analysis. Quote (unpublished data) : "We enrolled 100 wrists, some of them was operated at both wrists in different time. We considered the two data independently." Comment: A unit of analysis error likely as bilateral wrists were analysed independently ** Severity of CTS symptoms classified according to Stevens 1997. Mild = prolonged distal latency (relative or absolute) of sensory or mixed nerve action potentials (NAP) with or without sensory nerve action potential (SNAP) amplitude below the lower limit

	of normal. Moderate = abnormal median sensory latencies as above, and (relative or absolute) prolongation of median motor distal latency. Severe = prolonged median motor and sensory distal latencies, with either an absent SNAP or mixed NAP, or low-amplitude or absent thenar compound muscle action potentials. Needle examination often reveals fibrillation potentials, reduced recruitment, and motor unit potential changes ***Mean and SD for this outcome were not reported in sufficient detail to be entered into RevMan for statistical analysis (data only presented in graphical form). No appropriate data could be obtained from the trial authors. ****No SDs were reported for this outcome, therefore it could not be entered into RevMan for statistical analysis. *****This trial did not report on the number of workers' compensation participants that were excluded from this outcome analysis. Therefore, these data could not be entered into RevMan for analysis (Giattini 1999) published a study which appears to be a precursor to this trial. Attempts to obtain this information from the authors were unsuccessful

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Quote: "Patients were randomised into two groups using sequentially numbered, sealed envelopes." Quote (unpublished data): "The orthopedic unit communicated to the neuro-rehabilitation clinic the list of patients reserved for surgery and one person, not engaged in the study with the patients formulated the two random lists with sequentially numbered sealed envelopes." Comment: The sequence was not randomly generated
Allocation concealment (selection bias)	Unclear risk	Quote: "Patients were randomised into two groups using sequentially numbered, sealed envelopes." Comment: While the allocation sequence was probably adequately concealed, it is not clear whether the sequentially numbered, sealed envelopes were opaque or not
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Quote (unpublished data): "Participants were not blind to the intervention." Comment: Participants were not blinded to the intervention
Blinding (performance bias and detection bias) Other outcomes	Low risk	Quote: "In the present study, the examiner measured the time to complete each task using a chronometer, and was blind to the postsurgical treatment of each patient."

Provinciali 2000 (*Continued*)

		Quote: "The evaluation were made by a single examiner unaware of the postsurgical treatment." Comment: The outcome assessor was probably blind to treatment allocation
Incomplete outcome data (attrition bias) 12 weeks or less	Unclear risk	Comment: No exclusions/withdrawals were reported, but this does not mean that there were none. Thus, it is unclear whether the outcomes reported are based on a complete data set
Selective reporting (reporting bias)	High risk	Comment: All the outcomes were reported numerically or graphically, but only mean scores were provided (no SDs or 95% CIs) and no P values were reported (where applicable, outcomes were reported as being significantly or non-significantly different between time points or groups)
Other bias	Low risk	No other sources of bias identified.

Ritting 2012

Methods	RCT Blinded outcome assessor
Participants	**Details of sampling frame*** Total n eligible = 96 participants (96 wrists) Total n excluded pre-randomisation = 2 participants (2 participants declined randomisation) Total n randomised = 94 participants (94 wrists) Total n available for follow-up = 94 at first follow-up (9 to14 days) and 66 at final follow-up (6 to12 weeks) Total n analysed = 94 at first follow-up (9 to 14 days) and 66 at final follow-up (6 to 12 weeks) Intervention group 1, n = 45 participants; 30 participants completed study (15 participants lost to follow-up) Intervention group 2, n = 49 participants; 36 participants completed the study (13 participants lost to follow-up) **Gender distribution** Intervention group 1: 14 males; 31 females Intervention group 2: 7 males; 42 females **Mean age ± SD (range)** Intervention group 1: 46.3 years ± 14.8 years Intervention group 2: 44.8 years ± 12.3 years **Inclusion criteria** 1.Patients with CTS undergoing CTR 2.Adults (no age indicated)

	Exclusion criteria 1.Previous surgery for CTS 2.Ipsilateral hand, arm, shoulder surgery with continued symptoms **CTS diagnostic criteria (case definition)** Not reported **Details of surgical intervention** Mini-open CTR performed by a single surgeon **Symptom severity** Not recorded
Interventions	**Intervention group 1: short postoperative dressing** Participants were instructed to remove the bulky postoperative dressing at 48 to 72 hours and were provided with normal adhesive dressings. Participants were instructed to keep their wound dry until first postoperative visit at 9 to14 days. **Intervention group 2: extended postoperative dressing** Participants were instructed to keep the bulky postoperative dressing in situ until first postoperative visit at 9 to 14 days No participants in either group were splinted and all were instructed to commence finger mobilization immediately after surgery. Sutures were removed in both groups at the first postoperative visit at 9 to14 days
Outcomes	Outcomes assessed at 2 and 6 to 12 weeks postoperatively. 1. BCTQ 2. Grip strength (kg) 3. Tip pinch strength (kg) 4. 3-point pinch strength (kg) 5. Lateral pinch strength (kg) 6. Active extension range of motion (degrees)*** 7. Active flexion range of motion (degrees)*** 8. Active extension range of motion (degrees)*** 9. Active ulnar deviation range of motion (degrees)*** 10. Active radial deviation range of motion (degrees)*** 11. Active pronation range of motion (degrees)*** 12. Active supination range of motion (degrees)*** 13. Wound healing (qualitative assessment as either a pristine wound or a wound with any erythema, dehiscence, or drainage)
Notes	* Data reportedly based on the number of participants who underwent unilateral surgery. This suggests that treatment was only administered to 1 wrist per participant, and thus outcomes based on 1 wrist per participant. Hence unit of analysis error is unlikely to have occurred. ** Mean and SD for the postoperative intervals for the outcomes were not reported, and therefore could not be entered into RevMan for statistical analysis. Attempts to obtain this information from the authors have been unsuccessful ***This outcome was not specified in our review so data were not entered for statistical analysis
Risk of bias	

Ritting 2012 (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "A randomised number table for 2 treatment groups was computer generated and subjects were consecutively randomised." Comment: The randomisation sequence was probably generated adequately
Allocation concealment (selection bias)	Unclear risk	Quote: "A randomised number table for 2 treatment groups was computer generated and subjects were consecutively randomised." Comment: Not enough information to determine whether the allocation sequence was adequately concealed until interventions were assigned
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Comment: Participants were aware to which group they had been allocated
Blinding (performance bias and detection bias) Other outcomes	Low risk	Quote: " We took measurements using a goniometer, a hand dynamometer and a pinch meter under the care of 1 of 2 occupational therapists who were blinded to the protocol." Comment: The outcome assessor appears to have been blinded to the intervention
Incomplete outcome data (attrition bias) 12 weeks or less	High risk	Quote: "All 94 patients were available for analysis at 9 to 14 days, and 66 patients returned again between 6 and 12 weeks postoperatively." Quote: " This study has several weaknesses. Although initial follow-up was 100%, follow-up at 6 to 12 weeks was 70%. Both groups had an equal number of patient lost to follow-up which we speculate resulted from clinical improvement." Comment: The reported data for final postoperative visit (6 to12 weeks) is not based on a complete sample (15 participants were lost to follow-up in group 1 and 13 participants in group 2. The reported data for the 9 to14 day visit is a complete sample
Selective reporting (reporting bias)	Low risk	Comment: All outcomes specified in the methods section of the publication were reported in the prespecified way
Other bias	Low risk	Quote: " All patients completed objective preoperative testing including wrist range of motion and grip, tip and three-point pinch and lateral pinch strength. Subjective evaluation included the Levine-Katz questionnaire which is a previously validated outcomes scale for CTS." AND (Wound) "...the therapists could

		have used a graded system rather than a qualitative assessment of wound healing..." The majority of the outcome measures used were probably appropriate and standardised instruments

Stevinson 2003

Methods	Randomised, triple-blind, placebo-controlled trial Blinded participants, treaters and assessors
Participants	**Details of sampling frame*** Total n eligible = 90 participants Total n excluded pre-randomisation = 26 participants (7 declined participation; 19 excluded) Total n randomised = 64 participants (64 wrists) Total n available for follow-up = 62 participants (62 wrists) ** Total n analysed = 62 participants (62 wrists) ** Intervention group 1, n = 21 participants randomised; 20 completed trial Intervention group 2, n = 21 participants randomised; 20 completed trial Placebo group 3, n = 22 participants randomised; 22 completed trial **Gender distribution**** Intervention group 1: 3 males; 17 females Intervention group 2: 8 males; 12 females Placebo group 3: 2 males; 20 females **Mean ± SD (range) age**** Group 1: 47.5 years (range 30 to 68 years) Group 2: 51 years (range 30 to 68 years) Group 3: 51 years (range 33 to 57 years) **Inclusion criteria** 1. Aged between 18 and 70 years; 2. Undergoing elective hand surgery for CTS. **Exclusion criteria** 1. Currently taking homeopathic remedies 2. Reported previous hypersensitivity to homeopathy 3. Taking aspirin 4. Unable to complete the study diary or attend follow-up appointments 5. Subsequently underwent surgery on their other hand (exclusion of the second hand from the trial) **CTS Diagnosis (case definition)** Not reported **Details of surgical intervention** • CTR under local anaesthesia • No details of surgery reported **Symptom severity** Not reported
Interventions	**Intervention group 1:** High (30C) homeopathic arnica tablets were to be taken 3 times daily for 7 days preoperatively and 14 days postoperatively. **Intervention group 2:** Low (6C) homeopathic arnica tablets were to be taken 3 times

	daily for 7 days preoperatively and 14 days postoperatively. **Placebo group 3:** Placebo tablets (indistinguishable from the arnica tablets) were to be taken 3 times daily for 7 days preoperatively and 14 days postoperatively Patients were advised to refrain from handling the tablets or from eating, drinking, smoking or brushing teeth within 20 minutes of taking the tablets and were asked to suck the tablets rather than simply swallow them. Homeopathic and placebo tablets were supplied by A Nelson & Co Ltd. For all patients following surgery, a palmar plaster splint to maintain the wrist in slight dorsiflexion, allowing the fingers to be gently mobilized within the dressing and the hand was elevated in a high sling. Oral analgesic medication (paracetamol or diclofenac) was routinely prescribed on discharge. All patients were seen by the physiotherapist at 4, 9 and 14 days post-surgery. At day four the splint was removed and digits and wrists were mobilized. A Futura aluminium wrist splint was given to the patients to wear for a further week. Sutures were removed at day 14
Outcomes	1. Pain using the short-form McGill Pain Questionnaire which includes a 0 to 100 visual analogue scale (VAS) to indicate the intensity of pain and a list of fifteen descriptive words (for example, stabbing, gnawing, shooting), each rated on a 4-point scale (0 = none, 1 = mild, 2 = moderate, 3 = severe) yielding a total score ranging from 0 to 45. Measured at pre-surgery, and 4, 9, and 14 days post-surgery** 2. Objectively-measured bruising: a photograph of the patient's wrist at the distal crease was taken under standard lighting conditions. For each patient, frames representative of normal skin (thenar zone) and of the bruised areas (operative site) were selected. The distribution of red and blue pixels within each frame was calculated. This information, displayed as a histogram of the number of pixels (y-axis) against an increasing scale of colour brightness from 0 to 255 (x-axis), enabled a comparison of the colour of the bruised area with the colour of the normal skin. Measured at 4, 9, and 14 days post-surgery.** 3. Clinician-rated bruising, assessed independently by 2 plastic surgeons on a 3-point scale (0 = none, 1 = mild-moderate, 2 = severe). Measured at 4, 9, and 14 days post-surgery.** 4. Swelling: measured as wrist circumference (mm) at the distal wrist crease. Three readings were taken of each measurement. Measured at pre-surgery, and 4, 9, and 14 days post-surgery.** 5. Use of analgesic medication measured daily in the first 4 days post-surgery by ticking boxes in the study diary to indicate the number of tablets taken each day.*** 6. Adverse events to the medication.
Notes	* It is assumed that all participants had only 1 CTS-affected wrist, as one of the exclusion criteria was "subsequently undergoing surgery on the other hand", and in Table 1 pg 62 the number of right or left hands receiving surgery per group was reported, and the sum total is 64 hands. A unit of analysis error is unlikely to have occurred ** Data only reported for participants completing treatment (n = 62) **End point and change score data were only reported as median (range), which are not appropriate for entry into RevMan 5 for statistical analysis *** This outcome was not specified in our review so data were not entered for statistical analysis Attempts to contact authors for incomplete or unclear data were unsuccessful
Risk of bias	

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Medication bottles were labelled with study numbers derived from a computer-generated randomisation list in blocks of three by an individual not involved with running the trial." Comment: The randomisation sequence was probably generated adequately
Allocation concealment (selection bias)	Low risk	Quote: "Medication bottles were labelled with study numbers derived from a computer-generated randomisation list in blocks of three by an individual not involved with running the trial. The randomisation list was kept in a sealed envelope in a locked drawer until the end of the trial." Comment: The allocation sequence was probably adequately concealed until interventions were assigned
Blinding (performance bias and detection bias) Self reported outcomes	Low risk	Quote: "All patients and investigators, including the surgeon, physiotherapists and data analysts, remained blind to treatment allocation until after data analysis." Quote: "Patient blinding seemed to remain intact throughout the study. 7/20 patients in the arnica 6C group, 3/22 in the placebo group and 7/20 in the arnica 30C group correctly identified their treatment allocation at the end of the trial." Comment: Participants were probably blind to treatment allocation
Blinding (performance bias and detection bias) Other outcomes	Low risk	Quote: "All patients and investigators, including the surgeon, physiotherapists and data analysts, remained blind to treatment allocation until after data analysis." Comment: Outcome assessors were probably blind to treatment allocation
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote: "Of the 64 patients recruited to the trial, 62 were included in the analysis. One patient in the arnica 6C group did not undergo the scheduled surgery so was no longer eligible for the trial and one patient from the arnica 30C group withdrew from the study before undergoing surgery because she believed that the tablets were

		causing her to feel 'unhappy or low'. Quote: "In total there were data missing at one or more time points on at least one outcome for 10 patients - 3 of these were from the arnica 6C group, 5 from the placebo group and 2 from the arnica 30C group. " Quote: "Intention-to-treat analyses were conducted on all randomised patients remaining in the trial at the time of surgery. Missing data were replaced with the median value of the total sample." Comment: Incomplete outcome data clearly addressed
Incomplete outcome data (attrition bias) After 12 weeks	High risk	Comment: Not applicable, as the latest follow-up was done at the end of treatment (14 days post surgery)
Selective reporting (reporting bias)	Low risk	Comment: All outcomes specified in the methods section of the publication were reported in the pre-specified way
Other bias	Unclear risk	Quote: "Adherence was incomplete in all three groups. As judged by tablet counts at the end of the trial, the number of patients who had taken less than 90% of their tablets was 9/20 for the arnica 6C group, 7/22 for the placebo group and 6/20 for the arnica 30C group." Comment: It is not clear whether these protocol violators significantly influenced the data obtained

Williams 2008

Methods	Single-blind RCT Blinded outcome assessors
Participants	**Details of sampling frame*** Total n eligible = not reported Total n excluded pre-randomisation = not reported Total n randomised = 100 participants (100 wrists) Total n available for follow-up = 100 participants (100 wrists) Total n analysed = 100 participants (100 wrists) Intervention group 1, n = 49 participants Intervention group 2, n = 51 participants **Gender distribution** Group 1: 9 males; 40 females Group 2: 13 males; 38 females **Mean ± SD (range) age**

	Group 1: 57 years ± 13.4 years Group 2: 55 years ± 14.5 years **Mean ± SD (range) duration of CTS symptoms** Not reported **Inclusion criteria** 1. Patients diagnosed with CTS **Exclusion criteria** Not reported **CTS diagnostic criteria (case definition)**** Diagnosis was made from patient history and clinical examination. If there was any doubt, nerve conduction studies were performed **Details of surgical intervention**** Open CTR performed under local anaesthetic using a tourniquet **Symptom severity** Not reported
Interventions	**Group 1: bulky dressing for 24 hours** In Group 1, the hand was shown to the participant and it was explained that the Mepore dressing should stay in place for the full 2-week period. A bulky dressing of gauze, wool and crepe was placed over the top of the Mepore dressing. Participants were advised to remove the bulky gauze, wool and crepe after 24 hours. **Group 2: bulky dressing for 2 weeks** Participants in Group 2 were advised to leave the bulky gauze, wool and crepe dressing in situ for 2 weeks, when they would be seen for a postoperative visit. Participants in both groups were told to leave the Mepore dressing in place and contact the department should they have any problems during the 2-week interval
Outcomes	Outcomes assessed preoperatively and at the end of the 2-week treatment period 1. BCTQ i) Symptom Severity Score ii) Functional Status Score 2. Complications
Notes	* Quote(unpublished data): "No bilateral cases were performed as this was departmental procedure at the time. No patients who had treatment for both wrists at different times were included in the study as the time elapsed between treatments was longer that the study period and therefore patients could not be included twice."* Comment: No unit of analysis error ** Authors contacted to clarify unclear or unreported data. Unpublished data obtained directly from the authors through personal communication

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Quote: "Within a single list, performed by the same consultant or registrar plastic surgeon, patients could be randomly allocated to either of the two groups."

		Quote: "Patients were randomised preoperatively, at the time of consent, to a 24 h or 2 week group." Comment: Not enough information to determine the adequacy of the random sequence generation Quote (unpublished data): "Pieces of paper were drawn from an envelope for each patient to dictated which arm the patient was allocated."* Comment: The sequence was adequately generated
Allocation concealment (selection bias)	High risk	Quote: "Within a single list, performed by the same consultant or registrar plastic surgeon, patients could be randomly allocated to either of the two groups." Quote: "Patients were randomised preoperatively, at the time of consent, to a 24 h or 2 week group." Comment: Not enough information to determine whether the allocation was concealed Quote (unpublished data):" All the numbers were drawn out of the same envelope and the numbers were then replaced so as to maintain the likelihood of drawing each arm for each patient."* Comment: The allocation does not appear to have been adequately concealed
Blinding (performance bias and detection bias) Self reported outcomes	High risk	Quote (unpublished data): "This [participant blinding] was not possible as if they were in the group who had the dressing for the shorter period, they had the dressing removed earlier."* Comment: Participants and personnel were not blind to treatment allocation
Blinding (performance bias and detection bias) Other outcomes	Low risk	Quote (unpublished data): " Post-operatively all patients had the same scars and no dressings. Patients did not tell, or assessors ask how long the dressing had been applied and therefore all patients appeared the same to the assessors, independently of the study arm to which they had been allocated. The scores could them be matched to the intervention."* Comment: Outcome assessors were adequately blinded
Incomplete outcome data (attrition bias) 12 weeks or less	Low risk	Quote (unpublished data):"All patients returned for post-operative visits and were as-

		sessed ."* Quote: "No patients in the longer dressing wearers removed their dressing early. They were all still on at 2 weeks and no patients who were supposed to leave the dressing on briefly left it on for 2 weeks." Comment: The results were based on a complete data set. There were no protocol violators
Selective reporting (reporting bias)	Low risk	Comment: All outcomes reported in the methods were reported in the results section of the publication. All the outcomes were reported numerically with appropriate statistical analysis
Other bias	Low risk	No other sources of bias identified.

BCTQ: Boston Carpal Tunnel Questionnaire
CTR: carpal tunnel release
CTS: carpal tunnel syndrome
RCT: randomised controlled trial
SD: standard deviation
SE: standard error
VAS: visual analog score or scale

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Atherton 1999	Not a study investigating a rehabilitation treatment following carpal tunnel surgery
Cornesse 2010	Not a study investigating a rehabilitation treatment following carpal tunnel surgery
Gupta 2011	Not a study investigating a rehabilitation treatment following carpal tunnel surgery
Heuser 2007	Not a RCT
Husby 2001	Not a study investigating a rehabilitation treatment following carpal tunnel surgery
Karamanis 2011	Not a study investigating a rehabilitation treatment following carpal tunnel surgery
Ozer 2005	Not a study investigating a rehabilitation treatment following carpal tunnel surgery

(*Continued*)

Romeo 2011	Not a RCT

RCT: randomised controlled trial

Characteristics of studies awaiting assessment *[ordered by study ID]*

Chaise 1994

Methods	Randomised trial
Participants	195 participants
Interventions	Intervention group: naftidrofuryl Placebo group
Outcomes	Symptoms of sympathetic lability
Notes	This paper is in French and is awaiting translation. It will be included in future updates of this review

Gordon 2007

Methods	RCT*
Participants	
Interventions	
Outcomes	
Notes	*It is unknown whether this data set is a separate data set to Gordon 2010, and hence further clarification has been sought from the trial authors

NCT00435149

Methods	RCT (single blinded outcome assessor)*
Participants	**Details of sampling frame** Estimated enrolment: 100 participants **Setting:** Vanderbilt Orthopaedic Institute & Vanderbilt University **Inclusion criteria** 1. Patients undergoing open CTR 2. Patients must have clinical evidence of CTS 3. Patients must have positive electromyography results 4. English speaking patients only **Patient selection factors include**

NCT00435149 (*Continued*)

	1. Ability and willingness to follow instructions 2. Patients who are able and willing to return for follow-up evaluations 3. Patients of all races and genders 4. Patients who are able to follow care instructions **Exclusion criteria** 1. <18 years old 2. Pregnancy 3. Patients unwilling or unable to comply with rehabilitation program for CTR who indicate difficulty or inability to return for follow-up visits prescribed by the study protocol 4. Patients who qualify for inclusion in the study, but refuse consent **Surgical details** 1) Open CTR
Interventions	**Intervention group 1: immobilisation for 1 week post surgery** CTR followed by splinting **Intervention group 2: no immobilisation post surgery** CTR followed by a bandage over the incision site after surgery
Outcomes	Participants will be followed up for 6 months. 1. Function assessment questionnaire score 2. Pain score questionnaire 3. Measurements (no reporting of type of measurements to be taken)
Notes	* Trial investigators have indicated through private correspondence that this study has been completed as a pilot but was not published. They have not provided any further data to enable risk of bias evaluation or data for meta-analysis

CTR: carpal tunnel release
CTS: carpal tunnel syndrome
RCT: randomised controlled trial
VAS: visual analog scale

Characteristics of ongoing studies *[ordered by study ID]*

NCT00845325

Trial name or title	RCT (single blinded outcome assessor)*
Methods	**Details of sampling frame** Estimated enrolment: 100 participants **Setting:** Vanderbilt Orthopaedic Institute & Vanderbilt University **Inclusion criteria** 1. Patients undergoing open CTR 2. Patients must have clinical evidence of CTS 3. Patients must have positive electromyography results 4. English speaking patients only **Patient selection factors include**

	1. Ability and willingness to follow instructions 2. Patients who are able and willing to return for follow-up evaluations 3. Patients of all races and genders 4. Patients who are able to follow care instructions **Exclusion criteria** 1. <18 years old 2. Pregnancy 3. Patients unwilling or unable to comply with rehabilitation program for CTR who indicate difficulty or inability to return for follow-up visits prescribed by the study protocol 4. Patients who qualify for inclusion in the study, but refuse consent **Surgical details** Open CTR
Participants	**Intervention group 1: immobilisation for 1 week post surgery** CTR followed by splinting **Intervention group 2: no immobilisation** post surgery CTR followed by a bandage over the incision site after surgery
Interventions	Patients will be followed up for 6 months. 1. Function assessment questionnaire score 2. Pain score questionnaire 3. Measurements (no reporting of type of measurements to be taken)
Outcomes	* Trial investigators have indicated through private correspondence that this study has been completed as a pilot but was not published. They have not provided any further data to enable risk of bias evaluation or data for meta-analysis
Starting date	December 2008
Contact information	Stephen Colbert, University of Missouri-Columbia
Notes	

CTR: carpal tunnel release
CTS: carpal tunnel syndrome
RCT: randomised controlled trial

DATA AND ANALYSES

Comparison 1. Low-level laser versus placebo

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Change in CTS symptoms (night time pain)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
1.1 At 1 month post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
1.2 At 2 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
1.3 At 3 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
1.4 At 6 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
2 Change in CTS symptoms (palmar pain)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
2.1 At 1 month post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.73 [0.34, 1.54]
2.2 At 2 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.17 [0.02, 1.30]
2.3 At 3 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.33 [0.01, 7.86]
2.4 At 6 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	1.0 [0.07, 15.24]
3 Change in CTS symptoms (numbness)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
3.1 At 1 month post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.38 [0.11, 1.27]
3.2 At 2 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.08 [0.00, 1.31]
3.3 At 3 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.14 [0.01, 2.65]
3.4 At 6 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.2 [0.01, 3.99]
4 Change in CTS symptoms (paraesthesia)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
4.1 At 1 month post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.38 [0.11, 1.27]
4.2 At 2 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.08 [0.00, 1.31]
4.3 At 3 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.14 [0.01, 2.65]
4.4 At 6 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.2 [0.01, 3.99]
5 Number with CTS clinical signs (Durkan's, Tinel's, Phalen's tests, numbness, paraesthesia, nighttime pain)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
5.1 At 1 month post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	3.00 [0.33, 27.18]
5.2 At 2 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.14 [0.01, 2.65]
5.3 At 3 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
5.4 At 6 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
6 Iatrogenic symptoms (scar pain)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
6.1 At 1 month post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.56 [0.30, 1.06]
6.2 At 2 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.5 [0.14, 1.81]
6.3 At 3 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.33 [0.04, 3.02]
6.4 At 6 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.33 [0.01, 7.86]
7 Iatrogenic symptoms (pillar pain)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
7.1 At 1 month post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	1.33 [0.53, 3.36]
7.2 At 2 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.57 [0.19, 1.74]
7.3 At 3 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.67 [0.21, 2.12]
7.4 At 6 months post surgery	1	58	Risk Ratio (M-H, Random, 95% CI)	0.33 [0.01, 7.86]

8 Return to ADL or work (6 months)	1	58	Risk Ratio (M-H, Random, 95% CI)	1.0 [0.94, 1.07]
9 Adverse events (surgery)	1	58	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]

Comparison 2. Immobilisation (wrist splint) versus mobilisation (bulky dressing)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Change in CTS symptoms (patient report of being symptom free)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
1.1 At a mean of 6 months follow-up	1	43	Risk Ratio (M-H, Random, 95% CI)	0.94 [0.52, 1.70]
2 Long-term change in CTS symptoms (number of patients who reported being 'improved' or 'cured')	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
2.1 At a mean of 6 months follow-up	1	43	Risk Ratio (M-H, Random, 95% CI)	0.90 [0.76, 1.06]
3 Return to normal occupations	1	43	Risk Ratio (M-H, Fixed, 95% CI)	0.83 [0.62, 1.11]
3.1 At a mean of 5.7 months follow-up	1	43	Risk Ratio (M-H, Fixed, 95% CI)	0.83 [0.62, 1.11]
4 Adverse effects	1	43	Risk Ratio (M-H, Fixed, 95% CI)	0.22 [0.01, 5.16]

Comparison 3. Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Long-term improvement in functional ability (BCTQ Functional Status Score)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1 At 3 months	1	40	Mean Difference (IV, Fixed, 95% CI)	0.39 [-0.45, 1.23]
2 Short-term improvement in functional ability (BCTQ Functional Status Score)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
2.1 At 1 month	1	40	Mean Difference (IV, Fixed, 95% CI)	0.60 [-0.95, 2.15]
3 Change in CTS symptoms (BCTQ Symptom Severity Score)	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
3.1 At 2 weeks post surgery	1	52	Mean Difference (IV, Random, 95% CI)	-0.95 [-3.49, 1.59]
3.2 Change score between baseline and at 2 weeks	1	52	Mean Difference (IV, Random, 95% CI)	0.03 [-0.04, 0.10]
3.3 At 1 month post surgery	1	40	Mean Difference (IV, Random, 95% CI)	-0.34 [-1.53, 0.85]
3.4 At 3 months post surgery	1	40	Mean Difference (IV, Random, 95% CI)	1.60 [-0.12, 3.32]

4 Change in CTS symptoms (Symptom Intensity Score)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
4.1 At 2 weeks post surgery	1	52	Mean Difference (IV, Random, 95% CI)	-0.77 [-1.68, 0.14]
5 Change score between baseline and 2 weeks (Symptom Intensity Score)	1	52	Mean Difference (IV, Random, 95% CI)	0.11 [-0.01, 0.23]
6 Change in impairment (sensibility measured using static two-point discrimination)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
6.1 At 2 weeks post surgery	1	52	Mean Difference (IV, Random, 95% CI)	-1.43 [-2.50, -0.36]
7 Change score between baseline and 2 weeks (Discrimination Index)	1	52	Mean Difference (IV, Random, 95% CI)	-0.02 [-0.17, 0.13]
8 Iatrogenic Symptoms	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
8.1 Scar tenderness at 1 month post surgery	1	50	Risk Ratio (M-H, Random, 95% CI)	1.75 [0.90, 3.42]
8.2 Pillar pain at 1 month post surgery	1	50	Risk Ratio (M-H, Random, 95% CI)	2.4 [0.99, 5.81]
8.3 Scar discomfort/pain at 6 weeks	1	81	Risk Ratio (M-H, Random, 95% CI)	0.95 [0.59, 1.54]
8.4 Hypothenar pain at 6 weeks	1	81	Risk Ratio (M-H, Random, 95% CI)	1.25 [0.39, 3.99]
8.5 Thenar pain at 6 weeks	1	81	Risk Ratio (M-H, Random, 95% CI)	2.5 [0.24, 26.48]
8.6 Scar discomfort/pain at 6 months	1	81	Risk Ratio (M-H, Random, 95% CI)	1.19 [0.42, 3.38]
8.7 Hypothenar pain at 6 months	1	81	Risk Ratio (M-H, Random, 95% CI)	3.57 [0.39, 32.87]
8.8 Thenar pain at 6 months	1	81	Risk Ratio (M-H, Random, 95% CI)	1.19 [0.08, 18.36]
9 Adverse event	2		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
9.1 Discomfort or heavy feeling caused by intervention	1	40	Risk Ratio (M-H, Random, 95% CI)	33.0 [2.11, 515.02]
9.2 Bowstringing of flexor tendons	2	90	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]
9.3 Wound dehiscence	1	50	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]

Comparison 4. Specialised home elevation device versus standard sling

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Short-term improvement in CTS symptoms (VAS pain 0-10) (3 months or less)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 At the end of 5 days treatment	1	41	Mean Difference (IV, Random, 95% CI)	-0.5 [-1.36, 0.36]
2 Iatrogenic symptoms (swelling)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 At the end of 5 days treatment	1	41	Mean Difference (IV, Random, 95% CI)	4.0 [-40.27, 48.27]

Comparison 5. Controlled cold therapy versus ice therapy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Short-term improvement in CTS symptoms (VAS pain 0-10) (3 months or less)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 At the end of 3 days treatment (per protocol analysis)	1	44	Mean Difference (IV, Random, 95% CI)	-2.8 [-4.50, -1.10]
1.2 At the end of 3 days treatment (intention-to-treat analysis)	1	65	Mean Difference (IV, Random, 95% CI)	-1.90 [-3.51, -0.29]
1.3 Change from baseline to day 3 (per protocol analysis)	1	42	Mean Difference (IV, Random, 95% CI)	-2.8 [-4.88, -0.72]
1.4 Change from baseline to day 3 (intention-to-treat analysis)	1	63	Mean Difference (IV, Random, 95% CI)	-1.40 [-3.24, 0.44]
2 Iatrogenic symptoms (swelling)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 At the end of 3 days treatment (per protocol analysis)	1	48	Mean Difference (IV, Random, 95% CI)	0.0 [-1.02, 1.02]
2.2 At the end of 3 days treatment (intention-to-treat analysis)	1	72	Mean Difference (IV, Random, 95% CI)	-0.40 [-1.21, 0.41]
2.3 Change from baseline to day 3 (per protocol analysis)	1	47	Mean Difference (IV, Random, 95% CI)	-1.0 [-1.26, -0.74]
2.4 Change from baseline to day 3 (intention-to-treat analysis)	1	71	Mean Difference (IV, Random, 95% CI)	-1.1 [-1.33, -0.87]

Comparison 6. Bulky dressing plus splint versus light dressing

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Iatrogenic symptom (scar pain)	1	50	Risk Ratio (M-H, Random, 95% CI)	5.0 [0.25, 99.16]
2 Adverse event (median nerve, digital nerve, vascular, tendon complications, delayed wound healing)	1	50	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]

Comparison 7. Contrast bath plus exercise versus contrast bath

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Iatrogenic symptom (swelling)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Post treatment	1	42	Mean Difference (IV, Random, 95% CI)	-8.80 [-22.23, 4.63]

Comparison 8. Contrast bath plus exercises versus exercise

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Iatrogenic symptom (swelling)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Post treatment	1	33	Mean Difference (IV, Random, 95% CI)	23.20 [3.60, 42.80]

Comparison 9. Contrast bath versus exercise

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Iatrogenic symptom (swelling)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Post treatment	1	37	Mean Difference (IV, Random, 95% CI)	32.0 [12.61, 51.39]

Comparison 10. Arnica versus placebo

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Change in impairment measure (grip strength)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 At 1 week post surgery	1	74	Mean Difference (IV, Random, 95% CI)	11.40 [-3.78, 26.58]
1.2 At 2 weeks post surgery	1	74	Mean Difference (IV, Random, 95% CI)	5.40 [-18.63, 29.43]
2 Iatrogenic symptom (swelling; % wrist circumference change difference)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 At 1 week post surgery	1	74	Mean Difference (IV, Random, 95% CI)	0.20 [-0.53, 0.93]
2.2 At 2 weeks post surgery	1	74	Mean Difference (IV, Random, 95% CI)	-0.30 [-1.34, 0.74]

Comparison 11. High dose arnica oral tablets versus placebo

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Iatrogenic symptoms (number of patients with no clinician-rated bruising)	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 At 4 days	1	42	Risk Ratio (M-H, Fixed, 95% CI)	1.83 [0.50, 6.71]
1.2 At 9 days	1	42	Risk Ratio (M-H, Fixed, 95% CI)	1.38 [0.43, 4.42]
1.3 At 14 days	1	42	Risk Ratio (M-H, Fixed, 95% CI)	1.1 [0.42, 2.86]
2 Adverse effects	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
2.1 Arnica 30C vs placebo	1	40	Risk Ratio (M-H, Fixed, 95% CI)	1.0 [0.23, 4.37]

Comparison 12. Low dose arnica tablets versus placebo

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Iatrogenic symptoms (number of patients with no clinician-rated bruising)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
1.1 At 4 days	1	42	Risk Ratio (M-H, Random, 95% CI)	1.83 [0.50, 6.71]
1.2 At 9 days	1	42	Risk Ratio (M-H, Random, 95% CI)	0.83 [0.21, 3.24]
1.3 At 14 days	1	40	Risk Ratio (M-H, Random, 95% CI)	0.67 [0.22, 2.01]
2 Adverse events	1	40	Risk Ratio (M-H, Random, 95% CI)	0.67 [0.12, 3.57]

Comparison 13. High dose versus low dose oral arnica tablets

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Iatrogenic symptoms (number of patients with no clinician-rated bruising)	1		Risk Ratio (M-H, Random, 95% CI)	Subtotals only
1.1 At 4 days	1	40	Risk Ratio (M-H, Random, 95% CI)	1.0 [0.34, 2.93]
1.2 At 9 days	1	40	Risk Ratio (M-H, Random, 95% CI)	1.67 [0.46, 6.06]
1.3 At 14 days	1	40	Risk Ratio (M-H, Random, 95% CI)	1.5 [0.50, 4.52]
2 Adverse events	1	40	Risk Ratio (M-H, Fixed, 95% CI)	1.5 [0.28, 8.04]

Comparison 14. Multimodal hand therapy versus normal activities/exercise

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Long-term improvement in functional ability (BCTQ Functional Status Score)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1 DASH at 6 months post surgery	1	150	Mean Difference (IV, Fixed, 95% CI)	1.0 [-4.44, 6.44]
2 Change in impairment measure (grip strength)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
2.1 At the end of 2 weeks' treatment (2 weeks post surgery)	1	150	Mean Difference (IV, Fixed, 95% CI)	-0.70 [-4.00, 2.60]
2.2 2 weeks after treatment ended (4 weeks post surgery)	1	150	Mean Difference (IV, Fixed, 95% CI)	0.20 [-2.83, 3.23]
2.3 4 weeks after treatment ended (6 weeks post surgery)	1	150	Mean Difference (IV, Fixed, 95% CI)	0.10 [-2.81, 3.01]
2.4 10 weeks after treatment ended (12 weeks post surgery)	1	150	Mean Difference (IV, Fixed, 95% CI)	-0.60 [-3.43, 2.23]
2.5 6 months post-surgery	1	150	Mean Difference (IV, Fixed, 95% CI)	-0.40 [-3.59, 2.79]
3 Change in impairment measure (lateral pinch strength)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
3.1 At the end of 2 weeks' treatment (2 weeks post surgery)	1	150	Mean Difference (IV, Fixed, 95% CI)	-0.70 [-1.42, 0.02]
3.2 2 weeks after treatment ended (4 weeks post surgery)	1	150	Mean Difference (IV, Fixed, 95% CI)	0.0 [-0.67, 0.67]
3.3 4 weeks after treatment ended (6 weeks post surgery)	1	150	Mean Difference (IV, Fixed, 95% CI)	-0.10 [-0.89, 0.69]
3.4 10 weeks after treatment ended (12 weeks post surgery)	1	150	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-0.97, 0.57]
3.5 6 months post surgery	1	150	Mean Difference (IV, Fixed, 95% CI)	-0.20 [-0.94, 0.54]
4 Return to normal occupations	1		Risk Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 At the end of treatment (2 weeks post surgery)	1	150	Risk Ratio (M-H, Fixed, 95% CI)	0.96 [0.78, 1.18]
4.2 4 weeks after treatment ended (6 weeks post surgery)	1	150	Risk Ratio (M-H, Fixed, 95% CI)	1.02 [0.89, 1.17]
4.3 6 weeks after treatment ended (8 weeks post surgery)	1	150	Risk Ratio (M-H, Fixed, 95% CI)	1.04 [0.97, 1.12]
5 Adverse effects	1	150	Risk Ratio (M-H, Fixed, 95% CI)	0.53 [0.05, 5.69]

Comparison 15. Desensitisation therapy (as part of multiple interventions) versus no treatment

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Long-term improvement in functional ability (BCTQ Functional Status Score)	1	27	Mean Difference (IV, Random, 95% CI)	-0.03 [-0.39, 0.33]
1.1 At 12 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	-0.03 [-0.39, 0.33]
2 Short-term improvement in functional ability (BCTQ Functional Status Score)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 At 3 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	-0.30 [-0.76, 0.16]
2.2 At 6 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	0.02 [-0.35, 0.39]
3 Change in CTS symptoms (pain or discomfort)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
3.1 At 3 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	-13.30 [-27.29, 0. 69]
3.2 At 6 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	-9.40 [-23.87, 5.07]
3.3 At 12 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	4.9 [-14.69, 24.49]
4 Change in impairment measure (grip strength)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
4.1 At 3 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	0.41 [-3.95, 4.77]
4.2 At 6 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	1.80 [-4.01, 7.61]
4.3 At 12 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	-0.80 [-7.38, 5.78]
5 Iatrogenic symptoms (scar sensitivity using dolorimetry)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
5.1 At 3 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	0.26 [-0.30, 0.82]
5.2 At 6 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	0.16 [-0.49, 0.81]
5.3 At 12 weeks post surgery	1	27	Mean Difference (IV, Random, 95% CI)	-0.67 [-1.46, 0.12]
6 Adverse events (wound dehiscence)	1	27	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]

Comparison 16. Short duration dressing versus extended duration dressing

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Short-term improvement in functional ability (BCTQ Functional Status Score)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 At 2 weeks post surgery	1	100	Mean Difference (IV, Random, 95% CI)	0.10 [-0.25, 0.45]
1.2 Change in Functional Status Score baseline to 2 weeks	1	100	Mean Difference (IV, Random, 95% CI)	0.40 [0.05, 0.75]
2 Change in CTS symptoms (BCTQ Symptom Severity Score)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
2.1 At 2 weeks	1	100	Mean Difference (IV, Random, 95% CI)	0.0 [-0.26, 0.26]

2.2 Change in Symptom Severity Score baseline to 2 weeks	1	100	Mean Difference (IV, Random, 95% CI)	0.30 [0.01, 0.59]
3 Change in impairment measure (grip strength)	1	66	Mean Difference (IV, Random, 95% CI)	-16.0 [-21.57, -10.43]
3.1 At 6-12 weeks	1	66	Mean Difference (IV, Random, 95% CI)	-16.0 [-21.57, -10.43]
4 Change in impairment measure (pinch strength)	1		Mean Difference (IV, Random, 95% CI)	Subtotals only
4.1 Tip pinch 6-12 weeks	1	66	Mean Difference (IV, Random, 95% CI)	-1.20 [-2.35, -0.05]
4.2 Three point pinch at 6-12 weeks	1	66	Mean Difference (IV, Random, 95% CI)	-1.10 [-2.28, 0.08]
4.3 Lateral pinch at 6-12 weeks	1	66	Mean Difference (IV, Random, 95% CI)	-0.70 [-1.88, 0.48]
5 Adverse event	2	166	Risk Ratio (M-H, Random, 95% CI)	0.0 [0.0, 0.0]

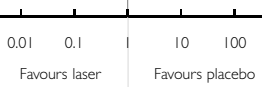
Analysis 1.1. Comparison 1 Low-level laser versus placebo, Outcome 1 Change in CTS symptoms (night time pain).

Review: Rehabilitation following carpal tunnel release

Comparison: 1 Low-level laser versus placebo

Outcome: 1 Change in CTS symptoms (night time pain)

Study or subgroup	Low-level laser n/N	Placebo n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 At 1 month post surgery					
Alves 2011	0/29	0/29			Not estimable
Subtotal (95% CI)	**29**	**29**			**Not estimable**
Total events: 0 (Low-level laser), 0 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
2 At 2 months post surgery					
Alves 2011	0/29	0/29			Not estimable
Subtotal (95% CI)	**29**	**29**			**Not estimable**
Total events: 0 (Low-level laser), 0 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
3 At 3 months post surgery					
Alves 2011	0/29	0/29			Not estimable
Subtotal (95% CI)	**29**	**29**			**Not estimable**
Total events: 0 (Low-level laser), 0 (Placebo)					



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Study or subgroup	Low-level laser n/N	Placebo n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Heterogeneity: not applicable					
Test for overall effect: not applicable					
4 At 6 months post surgery					
Alves 2011	0/29	0/29			Not estimable
Subtotal (95% CI)	**29**	**29**			**Not estimable**
Total events: 0 (Low-level laser), 0 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					

Analysis 1.2. Comparison 1 Low-level laser versus placebo, Outcome 2 Change in CTS symptoms (palmar pain).

Review: Rehabilitation following carpal tunnel release

Comparison: 1 Low-level laser versus placebo

Outcome: 2 Change in CTS symptoms (palmar pain)

Study or subgroup	Low-level laser n/N	Placebo n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 At 1 month post surgery					
Alves 2011	8/29	11/29		100.0 %	0.73 [0.34, 1.54]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**0.73 [0.34, 1.54]**
Total events: 8 (Low-level laser), 11 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.83 (P = 0.41)					
2 At 2 months post surgery					
Alves 2011	1/29	6/29		100.0 %	0.17 [0.02, 1.30]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**0.17 [0.02, 1.30]**
Total events: 1 (Low-level laser), 6 (Placebo)					
Heterogeneity: not applicable					

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Study or subgroup	Low-level laser n/N	Placebo n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Test for overall effect: Z = 1.71 (P = 0.087)					
3 At 3 months post surgery					
Alves 2011	0/29	1/29		100.0 %	0.33 [0.01, 7.86]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**0.33 [0.01, 7.86]**
Total events: 0 (Low-level laser), 1 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.68 (P = 0.50)					
4 At 6 months post surgery					
Alves 2011	1/29	1/29		100.0 %	1.00 [0.07, 15.24]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**1.00 [0.07, 15.24]**
Total events: 1 (Low-level laser), 1 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.0 (P = 1.0)					
Test for subgroup differences: Chi^2 = 2.01, df = 3 (P = 0.57), I^2 =0.0%					

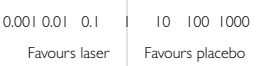
Analysis 1.3. Comparison 1 Low-level laser versus placebo, Outcome 3 Change in CTS symptoms (numbness).

Review: Rehabilitation following carpal tunnel release

Comparison: 1 Low-level laser versus placebo

Outcome: 3 Change in CTS symptoms (numbness)

Study or subgroup	Low-level laser n/N	Placebo n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 At 1 month post surgery					
Alves 2011	3/29	8/29		100.0 %	0.38 [0.11, 1.27]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**0.38 [0.11, 1.27]**
Total events: 3 (Low-level laser), 8 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.57 (P = 0.12)					
2 At 2 months post surgery					
Alves 2011	0/29	6/29		100.0 %	0.08 [0.00, 1.31]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**0.08 [0.00, 1.31]**
Total events: 0 (Low-level laser), 6 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.78 (P = 0.076)					
3 At 3 months post surgery					
Alves 2011	0/29	3/29		100.0 %	0.14 [0.01, 2.65]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**0.14 [0.01, 2.65]**
Total events: 0 (Low-level laser), 3 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.31 (P = 0.19)					
4 At 6 months post surgery					
Alves 2011	0/29	2/29		100.0 %	0.20 [0.01, 3.99]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**0.20 [0.01, 3.99]**
Total events: 0 (Low-level laser), 2 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.05 (P = 0.29)					
Test for subgroup differences: Chi^2 = 1.25, df = 3 (P = 0.74), I^2 =0.0%					

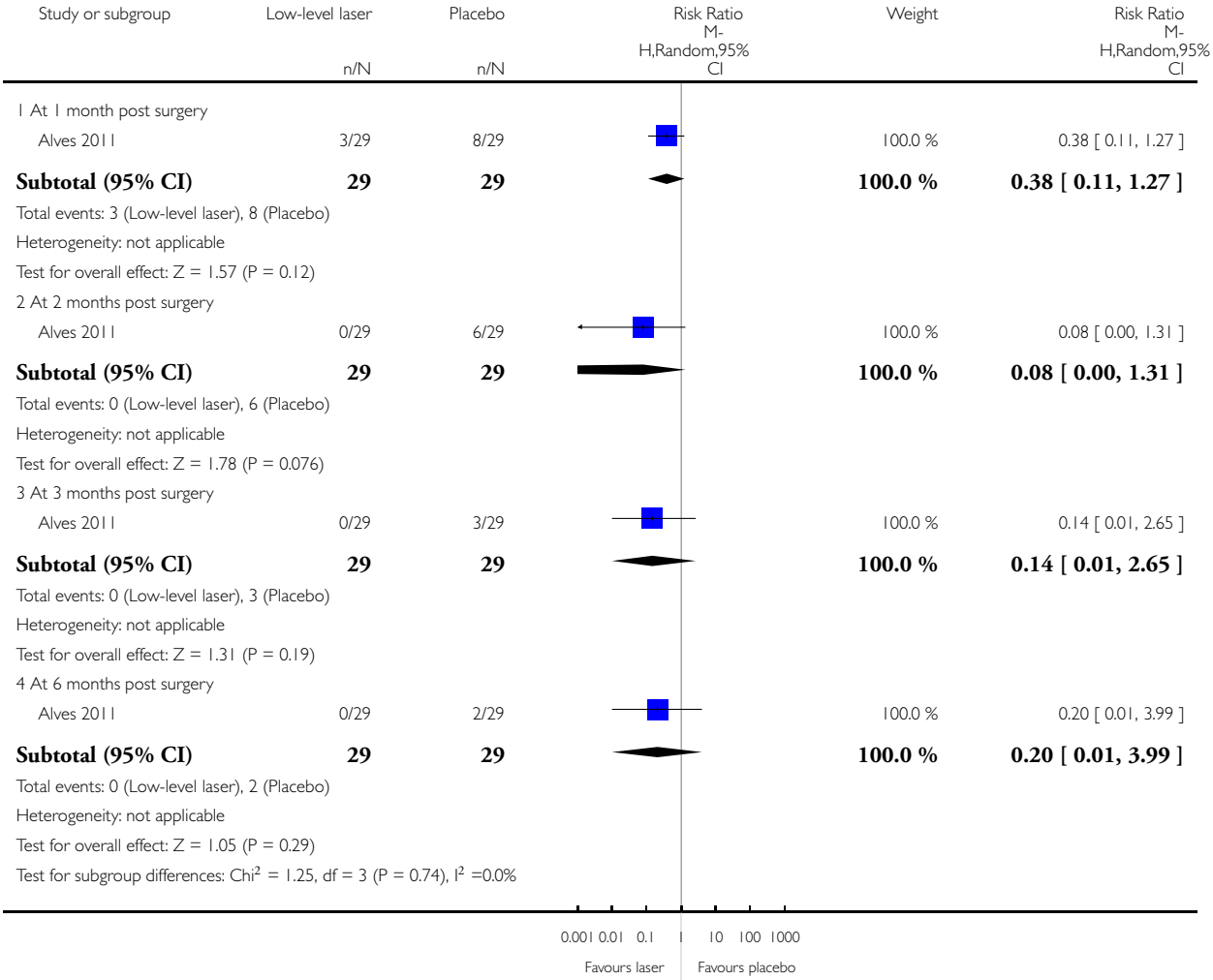


Analysis 1.4. Comparison 1 Low-level laser versus placebo, Outcome 4 Change in CTS symptoms (paraesthesia).

Review: Rehabilitation following carpal tunnel release

Comparison: 1 Low-level laser versus placebo

Outcome: 4 Change in CTS symptoms (paraesthesia)



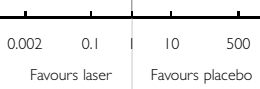
Analysis 1.5. Comparison 1 Low-level laser versus placebo, Outcome 5 Number with CTS clinical signs (Durkan's, Tinel's, Phalen's tests, numbness, paraesthesia, nighttime pain).

Review: Rehabilitation following carpal tunnel release

Comparison: 1 Low-level laser versus placebo

Outcome: 5 Number with CTS clinical signs (Durkan's, Tinel's, Phalen's tests, numbness, paraesthesia, nighttime pain)

Study or subgroup	Low-level laser n/N	Placebo n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 At 1 month post surgery					
Alves 2011	3/29	1/29		100.0 %	3.00 [0.33, 27.18]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**3.00 [0.33, 27.18]**
Total events: 3 (Low-level laser), 1 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.98 (P = 0.33)					
2 At 2 months post surgery					
Alves 2011	0/29	3/29		100.0 %	0.14 [0.01, 2.65]
Subtotal (95% CI)	**29**	**29**		**100.0 %**	**0.14 [0.01, 2.65]**
Total events: 0 (Low-level laser), 3 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.31 (P = 0.19)					
3 At 3 months post surgery					
Alves 2011	0/29	0/29			Not estimable
Subtotal (95% CI)	**29**	**29**			**Not estimable**
Total events: 0 (Low-level laser), 0 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
4 At 6 months post surgery					
Alves 2011	0/29	0/29			Not estimable
Subtotal (95% CI)	**29**	**29**			**Not estimable**
Total events: 0 (Low-level laser), 0 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Test for subgroup differences: Chi^2 = 2.66, df = 1 (P = 0.10), I^2 =62%					

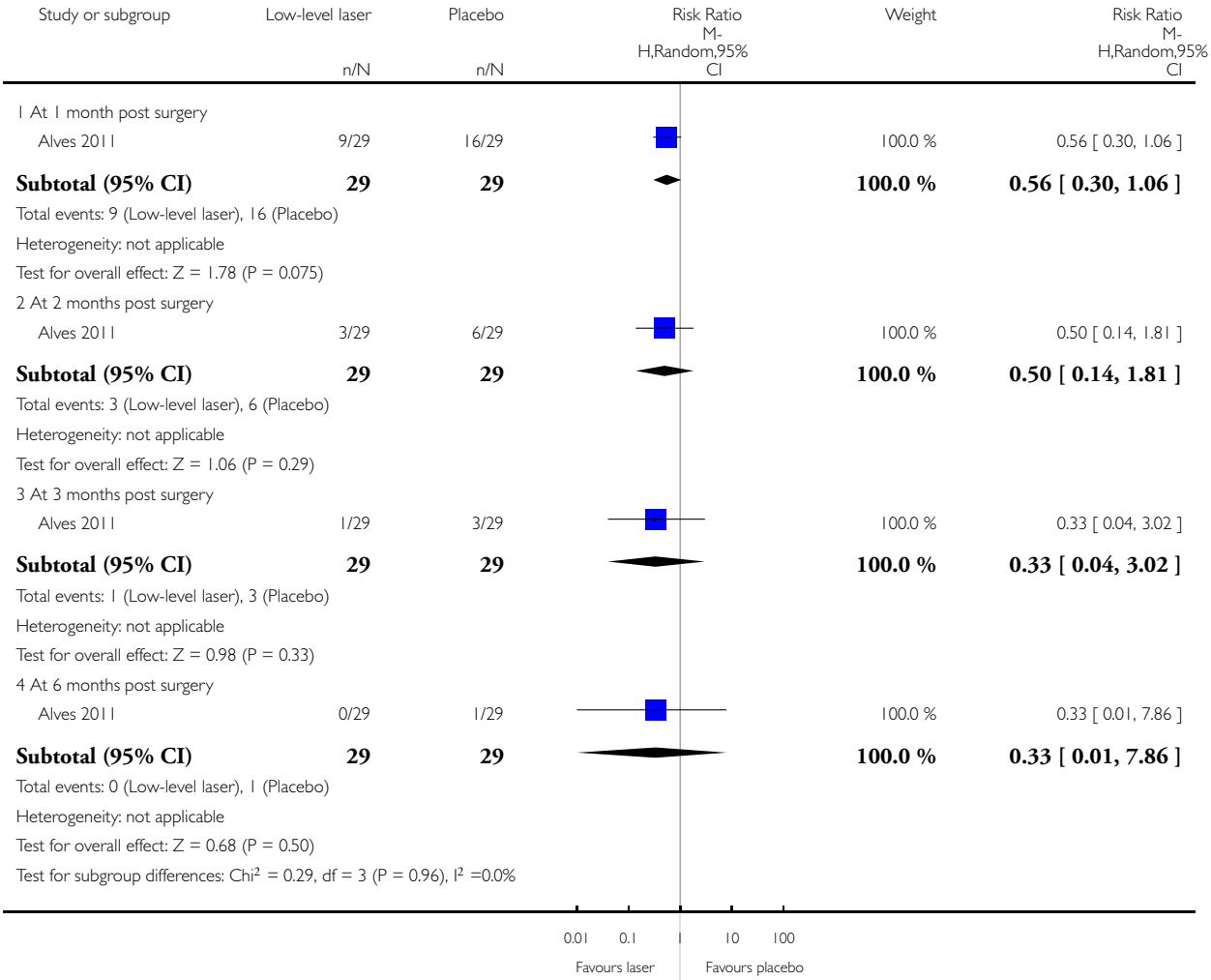


Analysis 1.6. Comparison 1 Low-level laser versus placebo, Outcome 6 Iatrogenic symptoms (scar pain).

Review: Rehabilitation following carpal tunnel release

Comparison: 1 Low-level laser versus placebo

Outcome: 6 Iatrogenic symptoms (scar pain)

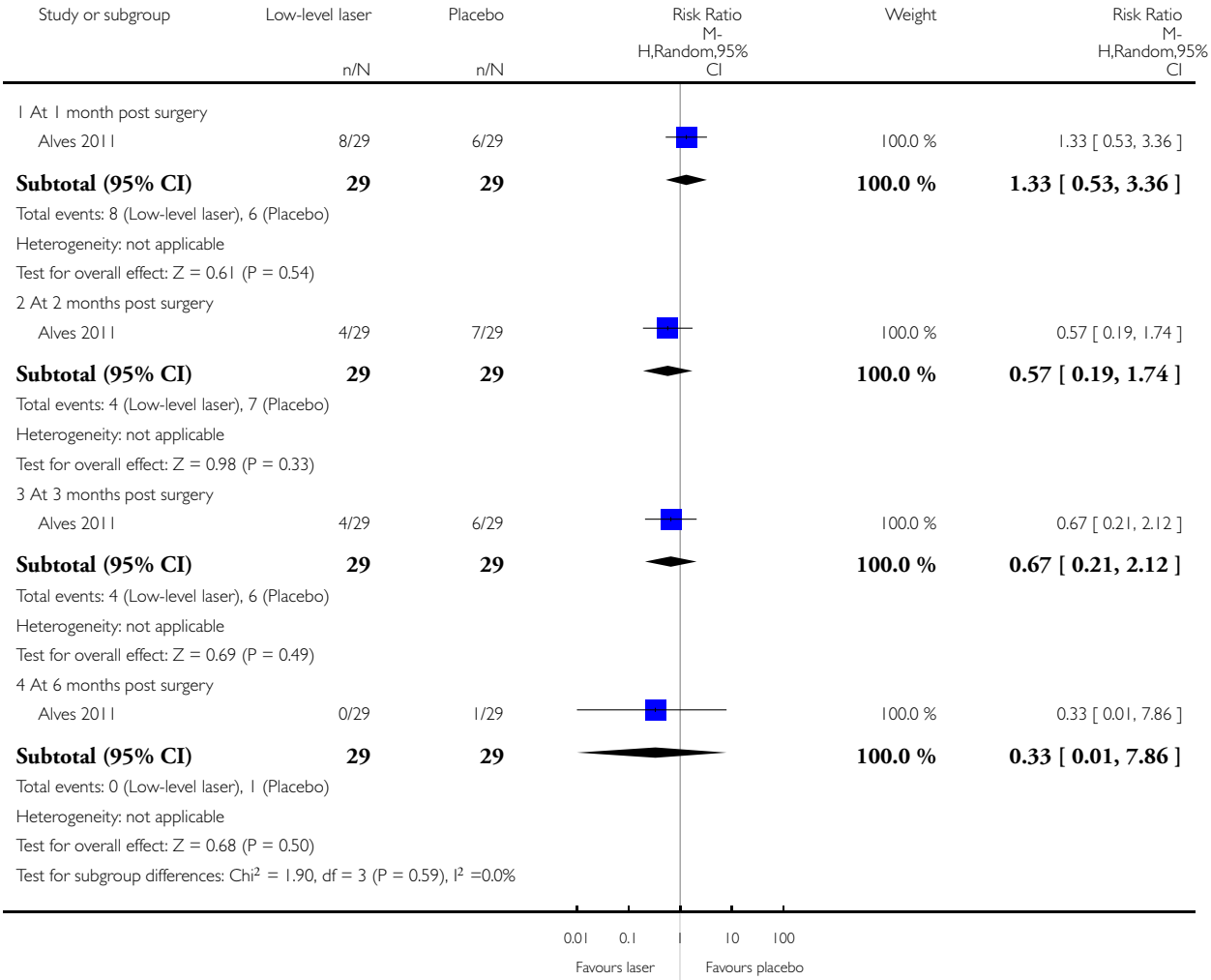


Analysis 1.7. Comparison 1 Low-level laser versus placebo, Outcome 7 Iatrogenic symptoms (pillar pain).

Review: Rehabilitation following carpal tunnel release

Comparison: 1 Low-level laser versus placebo

Outcome: 7 Iatrogenic symptoms (pillar pain)

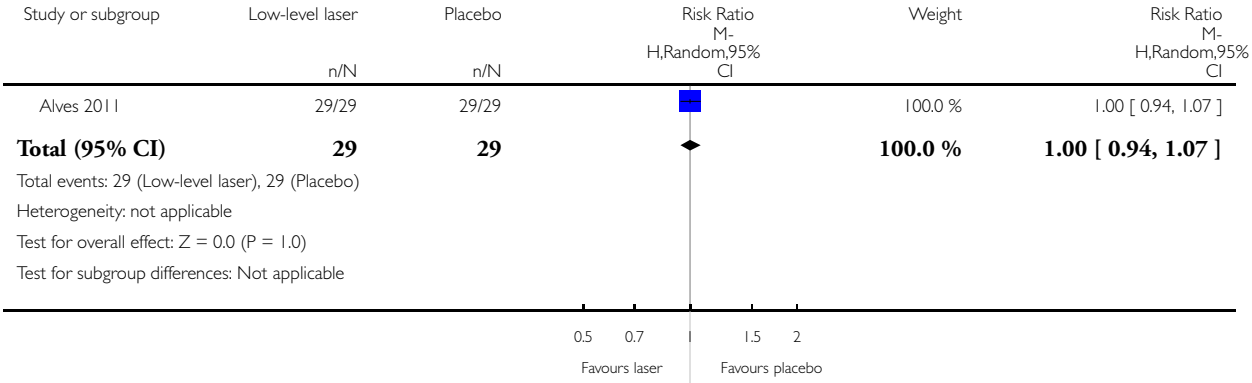


Analysis 1.8. Comparison 1 Low-level laser versus placebo, Outcome 8 Return to ADL or work (6 months).

Review: Rehabilitation following carpal tunnel release

Comparison: 1 Low-level laser versus placebo

Outcome: 8 Return to ADL or work (6 months)

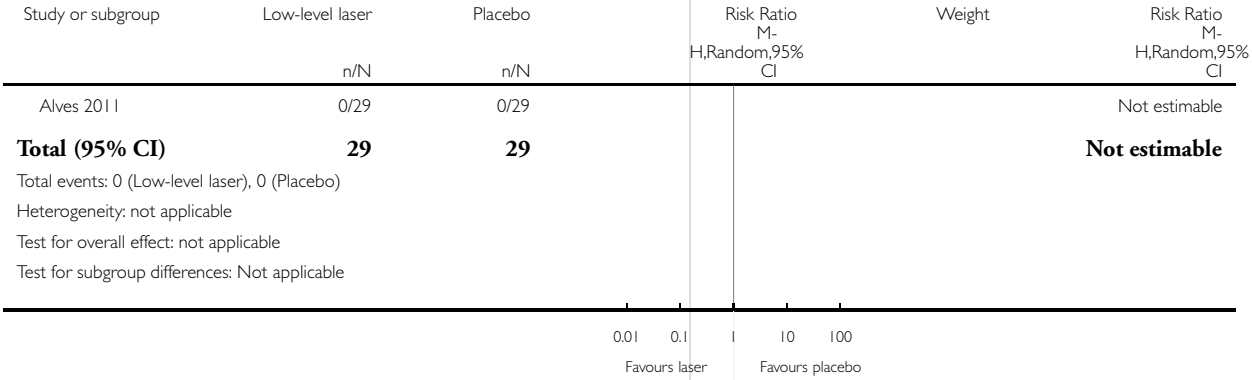


Analysis 1.9. Comparison 1 Low-level laser versus placebo, Outcome 9 Adverse events (surgery).

Review: Rehabilitation following carpal tunnel release

Comparison: 1 Low-level laser versus placebo

Outcome: 9 Adverse events (surgery)



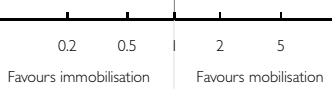
Analysis 2.1. Comparison 2 Immobilisation (wrist splint) versus mobilisation (bulky dressing), Outcome 1 Change in CTS symptoms (patient report of being symptom free).

Review: Rehabilitation following carpal tunnel release

Comparison: 2 Immobilisation (wrist splint) versus mobilisation (bulky dressing)

Outcome: 1 Change in CTS symptoms (patient report of being symptom free)

Study or subgroup	Immobilisation n/N	Mobilisation n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 At a mean of 6 months follow-up					
Bury 1995	13/26	9/17		100.0 %	0.94 [0.52, 1.70]
Subtotal (95% CI)	**26**	**17**		**100.0 %**	**0.94 [0.52, 1.70]**
Total events: 13 (Immobilisation), 9 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.19 (P = 0.85)					



Analysis 2.2. Comparison 2 Immobilisation (wrist splint) versus mobilisation (bulky dressing), Outcome 2 Long-term change in CTS symptoms (number of patients who reported being 'improved' or 'cured').

Review: Rehabilitation following carpal tunnel release

Comparison: 2 Immobilisation (wrist splint) versus mobilisation (bulky dressing)

Outcome: 2 Long-term change in CTS symptoms (number of patients who reported being 'improved' or 'cured')

Study or subgroup	Immobilisation n/N	Mobilisation n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 At a mean of 6 months follow-up					
Bury 1995	23/26	17/17		100.0 %	0.90 [0.76, 1.06]
Subtotal (95% CI)	**26**	**17**		**100.0 %**	**0.90 [0.76, 1.06]**
Total events: 23 (Immobilisation), 17 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.31 (P = 0.19)					

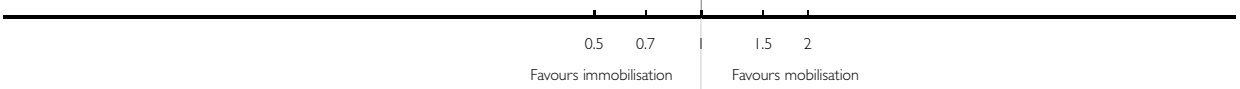
Analysis 2.3. Comparison 2 Immobilisation (wrist splint) versus mobilisation (bulky dressing), Outcome 3 Return to normal occupations.

Review: Rehabilitation following carpal tunnel release

Comparison: 2 Immobilisation (wrist splint) versus mobilisation (bulky dressing)

Outcome: 3 Return to normal occupations

Study or subgroup	Immobilisation n/N	Mobilisation n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 At a mean of 5.7 months follow-up					
Bury 1995	19/26	15/17		100.0 %	0.83 [0.62, 1.11]
Total (95% CI)	**26**	**17**		**100.0 %**	**0.83 [0.62, 1.11]**
Total events: 19 (Immobilisation), 15 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.27 (P = 0.20)					
Test for subgroup differences: Not applicable					



Analysis 2.4. Comparison 2 Immobilisation (wrist splint) versus mobilisation (bulky dressing), Outcome 4 Adverse effects.

Review: Rehabilitation following carpal tunnel release

Comparison: 2 Immobilisation (wrist splint) versus mobilisation (bulky dressing)

Outcome: 4 Adverse effects

Study or subgroup	Immobilisation n/N	Mobilisation n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Bury 1995	0/26	1/17		100.0 %	0.22 [0.01, 5.16]
Total (95% CI)	**26**	**17**		**100.0 %**	**0.22 [0.01, 5.16]**

Total events: 0 (Immobilisation), 1 (Mobilisation)
Heterogeneity: not applicable
Test for overall effect: Z = 0.94 (P = 0.35)
Test for subgroup differences: Not applicable

Analysis 3.1. Comparison 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation, Outcome 1 Long-term improvement in functional ability (BCTQ Functional Status Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

Outcome: 1 Long-term improvement in functional ability (BCTQ Functional Status Score)

Study or subgroup	Immobilisation N	Mean(SD)	Mobilisation N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 At 3 months							
Cebesoy 2007	20	10.65 (1.35)	20	10.26 (1.35)		100.0 %	0.39 [-0.45, 1.23]
Subtotal (95% CI)	**20**		**20**			**100.0 %**	**0.39 [-0.45, 1.23]**

Heterogeneity: not applicable
Test for overall effect: Z = 0.91 (P = 0.36)
Test for subgroup differences: Not applicable

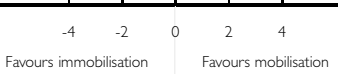
Analysis 3.2. Comparison 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation, Outcome 2 Short-term improvement in functional ability (BCTQ Functional Status Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

Outcome: 2 Short-term improvement in functional ability (BCTQ Functional Status Score)

Study or subgroup	Immobilisation N	Mean(SD)	Mobilisation N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 At 1 month							
Cebesoy 2007	20	13.5 (2.5)	20	12.9 (2.5)		100.0 %	0.60 [-0.95, 2.15]
Subtotal (95% CI)	**20**		**20**			**100.0 %**	**0.60 [-0.95, 2.15]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.76 (P = 0.45)							
Test for subgroup differences: Not applicable							



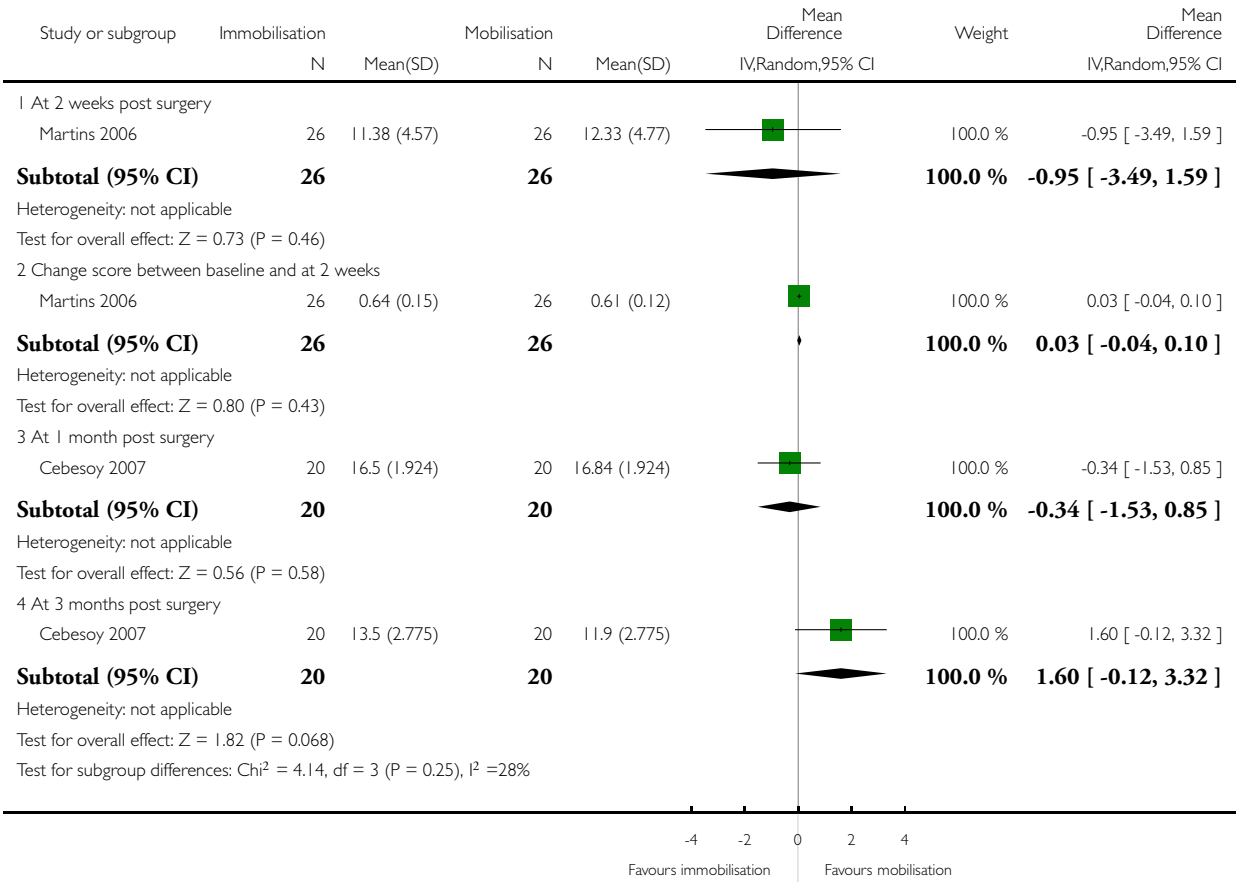
Analysis 3.3. Comparison 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation, Outcome 3 Change in CTS symptoms (BCTQ Symptom Severity Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

Outcome: 3 Change in CTS symptoms (BCTQ Symptom Severity Score)

Study or subgroup	Immobilisation N	Mean(SD)	Mobilisation N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 2 weeks post surgery							
Martins 2006	26	11.38 (4.57)	26	12.33 (4.77)		100.0 %	-0.95 [-3.49, 1.59]
Subtotal (95% CI)	**26**		**26**			**100.0 %**	**-0.95 [-3.49, 1.59]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.73 (P = 0.46)							
2 Change score between baseline and at 2 weeks							
Martins 2006	26	0.64 (0.15)	26	0.61 (0.12)		100.0 %	0.03 [-0.04, 0.10]
Subtotal (95% CI)	**26**		**26**			**100.0 %**	**0.03 [-0.04, 0.10]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.80 (P = 0.43)							
3 At 1 month post surgery							
Cebesoy 2007	20	16.5 (1.924)	20	16.84 (1.924)		100.0 %	-0.34 [-1.53, 0.85]
Subtotal (95% CI)	**20**		**20**			**100.0 %**	**-0.34 [-1.53, 0.85]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.56 (P = 0.58)							
4 At 3 months post surgery							
Cebesoy 2007	20	13.5 (2.775)	20	11.9 (2.775)		100.0 %	1.60 [-0.12, 3.32]
Subtotal (95% CI)	**20**		**20**			**100.0 %**	**1.60 [-0.12, 3.32]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.82 (P = 0.068)							
Test for subgroup differences: Chi^2 = 4.14, df = 3 (P = 0.25), I^2 =28%							

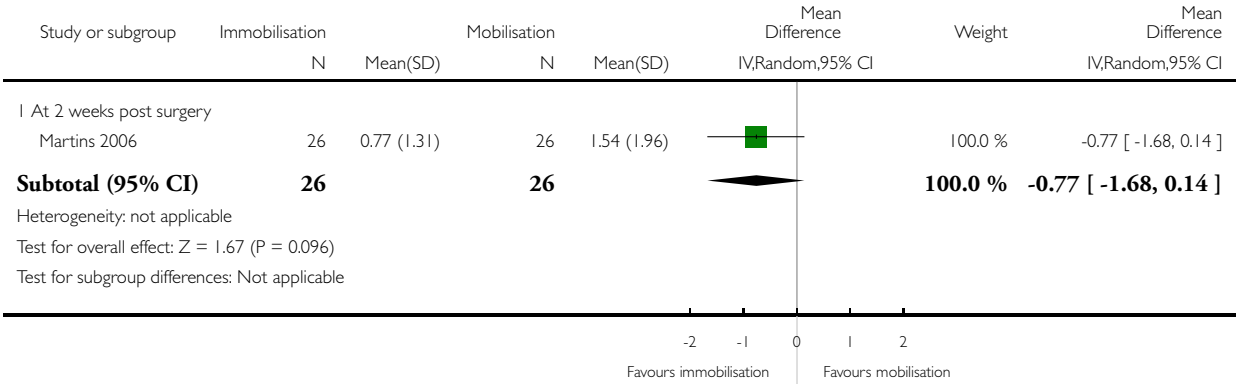


Analysis 3.4. Comparison 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation, Outcome 4 Change in CTS symptoms (Symptom Intensity Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

Outcome: 4 Change in CTS symptoms (Symptom Intensity Score)

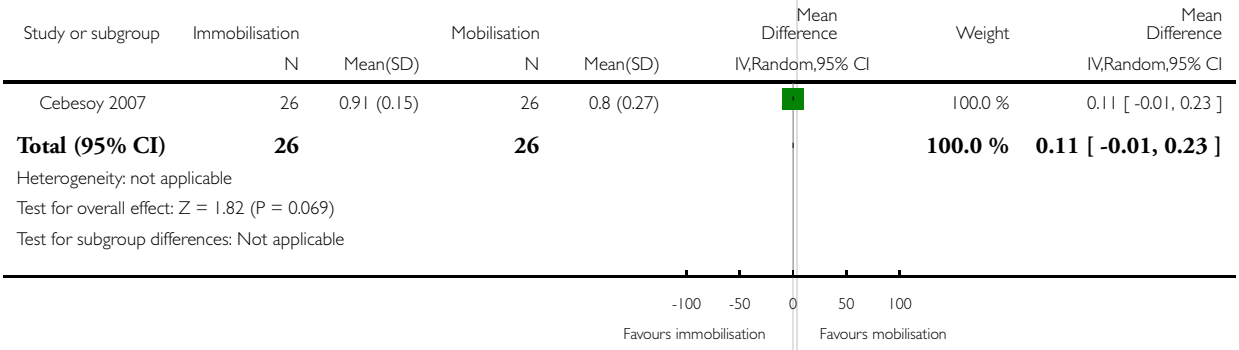


Analysis 3.5. Comparison 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation, Outcome 5 Change score between baseline and 2 weeks (Symptom Intensity Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

Outcome: 5 Change score between baseline and 2 weeks (Symptom Intensity Score)



Analysis 3.6. Comparison 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation, Outcome 6 Change in impairment (sensibility measured using static two-point discrimination).

Review: Rehabilitation following carpal tunnel release

Comparison: 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

Outcome: 6 Change in impairment (sensibility measured using static two-point discrimination)

Study or subgroup	Immobilisation N	Mean(SD)	Mobilisation N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 2 weeks post surgery							
Martins 2006	26	3.69 (1.19)	26	5.12 (2.53)		100.0 %	-1.43 [-2.50, -0.36]
Subtotal (95% CI)	**26**		**26**			**100.0 %**	**-1.43 [-2.50, -0.36]**

Heterogeneity: not applicable

Test for overall effect: Z = 2.61 (P = 0.0091)

Test for subgroup differences: Not applicable

Analysis 3.7. Comparison 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation, Outcome 7 Change score between baseline and 2 weeks (Discrimination Index).

Review: Rehabilitation following carpal tunnel release

Comparison: 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

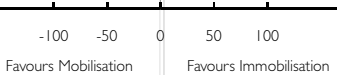
Outcome: 7 Change score between baseline and 2 weeks (Discrimination Index)

Study or subgroup	Immobilisation N	Mean(SD)	Mobilisation N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Martins 2006	26	0.27 (0.27)	26	0.29 (0.28)		100.0 %	-0.02 [-0.17, 0.13]
Total (95% CI)	**26**		**26**			**100.0 %**	**-0.02 [-0.17, 0.13]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.26 (P = 0.79)

Test for subgroup differences: Not applicable



Analysis 3.8. Comparison 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation, Outcome 8 Iatrogenic Symptoms.

Review: Rehabilitation following carpal tunnel release

Comparison: 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

Outcome: 8 Iatrogenic Symptoms

Study or subgroup	Immobilisation n/N	Mobilisation n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 Scar tenderness at 1 month post surgery					
Cook 1995	14/25	8/25		100.0 %	1.75 [0.90, 3.42]
Subtotal (95% CI)	**25**	**25**		**100.0 %**	**1.75 [0.90, 3.42]**
Total events: 14 (Immobilisation), 8 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.64 (P = 0.10)					
2 Pillar pain at 1 month post surgery					
Cook 1995	12/25	5/25		100.0 %	2.40 [0.99, 5.81]
Subtotal (95% CI)	**25**	**25**		**100.0 %**	**2.40 [0.99, 5.81]**
Total events: 12 (Immobilisation), 5 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.94 (P = 0.052)					
3 Scar discomfort/pain at 6 weeks					
Finsen 1999	16/36	21/45		100.0 %	0.95 [0.59, 1.54]
Subtotal (95% CI)	**36**	**45**		**100.0 %**	**0.95 [0.59, 1.54]**
Total events: 16 (Immobilisation), 21 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.20 (P = 0.84)					
4 Hypothenar pain at 6 weeks					
Finsen 1999	5/36	5/45		100.0 %	1.25 [0.39, 3.99]
Subtotal (95% CI)	**36**	**45**		**100.0 %**	**1.25 [0.39, 3.99]**
Total events: 5 (Immobilisation), 5 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.38 (P = 0.71)					
5 Thenar pain at 6 weeks					
Finsen 1999	2/36	1/45		100.0 %	2.50 [0.24, 26.48]
Subtotal (95% CI)	**36**	**45**		**100.0 %**	**2.50 [0.24, 26.48]**
Total events: 2 (Immobilisation), 1 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.76 (P = 0.45)					

(*Continued* . . .)

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Study or subgroup	Immobilisation n/N	Mobilisation n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
6 Scar discomfort/pain at 6 months					
Finsen 1999	6/37	6/44		100.0 %	1.19 [0.42, 3.38]
Subtotal (95% CI)	**37**	**44**		**100.0 %**	**1.19 [0.42, 3.38]**
Total events: 6 (Immobilisation), 6 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.33 (P = 0.74)					
7 Hypothenar pain at 6 months					
Finsen 1999	3/37	1/44		100.0 %	3.57 [0.39, 32.87]
Subtotal (95% CI)	**37**	**44**		**100.0 %**	**3.57 [0.39, 32.87]**
Total events: 3 (Immobilisation), 1 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.12 (P = 0.26)					
8 Thenar pain at 6 months					
Finsen 1999	1/37	1/44		100.0 %	1.19 [0.08, 18.36]
Subtotal (95% CI)	**37**	**44**		**100.0 %**	**1.19 [0.08, 18.36]**
Total events: 1 (Immobilisation), 1 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.12 (P = 0.90)					

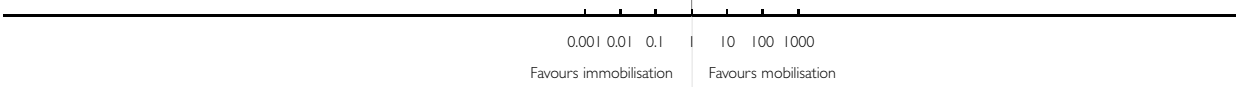
Analysis 3.9. Comparison 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation, Outcome 9 Adverse event.

Review: Rehabilitation following carpal tunnel release

Comparison: 3 Immobilisation (plaster of Paris splint) versus bulky dressing and mobilisation

Outcome: 9 Adverse event

Study or subgroup	Immobilisation n/N	Mobilisation n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 Discomfort or heavy feeling caused by intervention					
Cebesoy 2007	16/20	0/20		100.0 %	33.00 [2.11, 515.02]
Subtotal (95% CI)	**20**	**20**		**100.0 %**	**33.00 [2.11, 515.02]**
Total events: 16 (Immobilisation), 0 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: Z = 2.49 (P = 0.013)					
2 Bowstringing of flexor tendons					
Cebesoy 2007	0/20	0/20			Not estimable
Cook 1995	0/25	0/25			Not estimable
Subtotal (95% CI)	**45**	**45**			**Not estimable**
Total events: 0 (Immobilisation), 0 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
3 Wound dehiscence					
Cook 1995	0/25	0/25			Not estimable
Subtotal (95% CI)	**25**	**25**			**Not estimable**
Total events: 0 (Immobilisation), 0 (Mobilisation)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Test for subgroup differences: Not applicable					

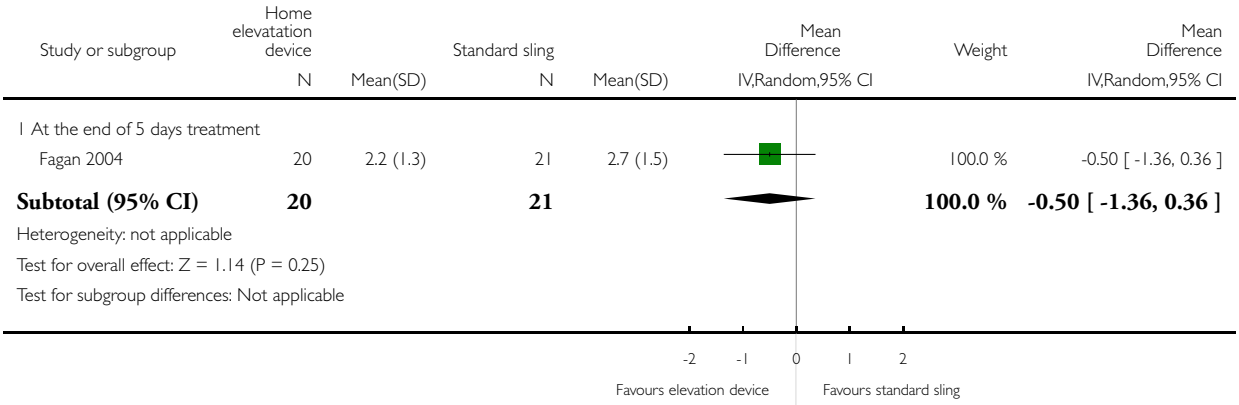


Analysis 4.1. Comparison 4 Specialised home elevation device versus standard sling, Outcome 1 Short-term improvement in CTS symptoms (VAS pain 0-10) (3 months or less).

Review: Rehabilitation following carpal tunnel release

Comparison: 4 Specialised home elevation device versus standard sling

Outcome: 1 Short-term improvement in CTS symptoms (VAS pain 0-10) (3 months or less)

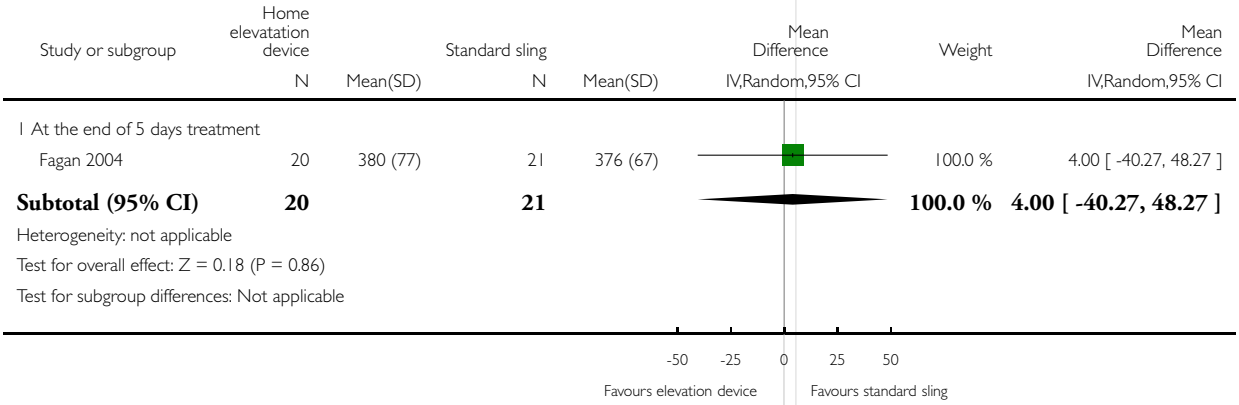


Analysis 4.2. Comparison 4 Specialised home elevation device versus standard sling, Outcome 2 Iatrogenic symptoms (swelling).

Review: Rehabilitation following carpal tunnel release

Comparison: 4 Specialised home elevation device versus standard sling

Outcome: 2 Iatrogenic symptoms (swelling)



Analysis 5.1. Comparison 5 Controlled cold therapy versus ice therapy, Outcome 1 Short-term improvement in CTS symptoms (VAS pain 0-10) (3 months or less).

Review: Rehabilitation following carpal tunnel release

Comparison: 5 Controlled cold therapy versus ice therapy

Outcome: 1 Short-term improvement in CTS symptoms (VAS pain 0-10) (3 months or less)

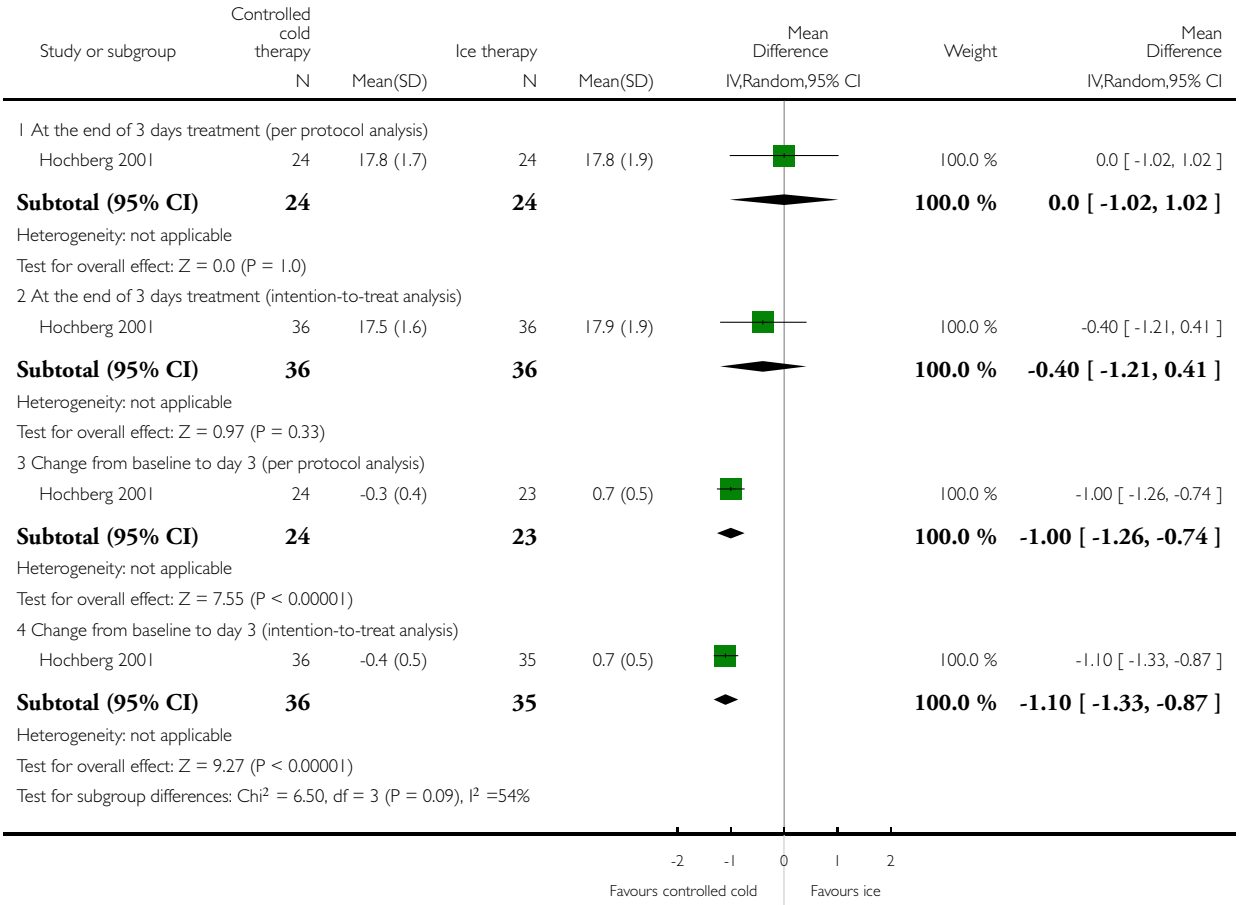
Study or subgroup	Controlled cold therapy N	Mean(SD)	Ice therapy N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At the end of 3 days treatment (per protocol analysis)							
Hochberg 2001	22	4.5 (3.2)	22	7.3 (2.5)		100.0 %	-2.80 [-4.50, -1.10]
Subtotal (95% CI)	**22**		**22**			**100.0 %**	**-2.80 [-4.50, -1.10]**
Heterogeneity: not applicable							
Test for overall effect: Z = 3.23 (P = 0.0012)							
2 At the end of 3 days treatment (intention-to-treat analysis)							
Hochberg 2001	31	4.7 (3.4)	34	6.6 (3.2)		100.0 %	-1.90 [-3.51, -0.29]
Subtotal (95% CI)	**31**		**34**			**100.0 %**	**-1.90 [-3.51, -0.29]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.31 (P = 0.021)							
3 Change from baseline to day 3 (per protocol analysis)							
Hochberg 2001	20	-3.8 (4.1)	22	-1 (2.5)		100.0 %	-2.80 [-4.88, -0.72]
Subtotal (95% CI)	**20**		**22**			**100.0 %**	**-2.80 [-4.88, -0.72]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.64 (P = 0.0083)							
4 Change from baseline to day 3 (intention-to-treat analysis)							
Hochberg 2001	29	-3.2 (4.1)	34	-1.8 (3.2)		100.0 %	-1.40 [-3.24, 0.44]
Subtotal (95% CI)	**29**		**34**			**100.0 %**	**-1.40 [-3.24, 0.44]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.49 (P = 0.14)							
Test for subgroup differences: Chi^2 = 1.66, df = 3 (P = 0.65), I^2 =0.0%							

Analysis 5.2. Comparison 5 Controlled cold therapy versus ice therapy, Outcome 2 Iatrogenic symptoms (swelling).

Review: Rehabilitation following carpal tunnel release

Comparison: 5 Controlled cold therapy versus ice therapy

Outcome: 2 Iatrogenic symptoms (swelling)

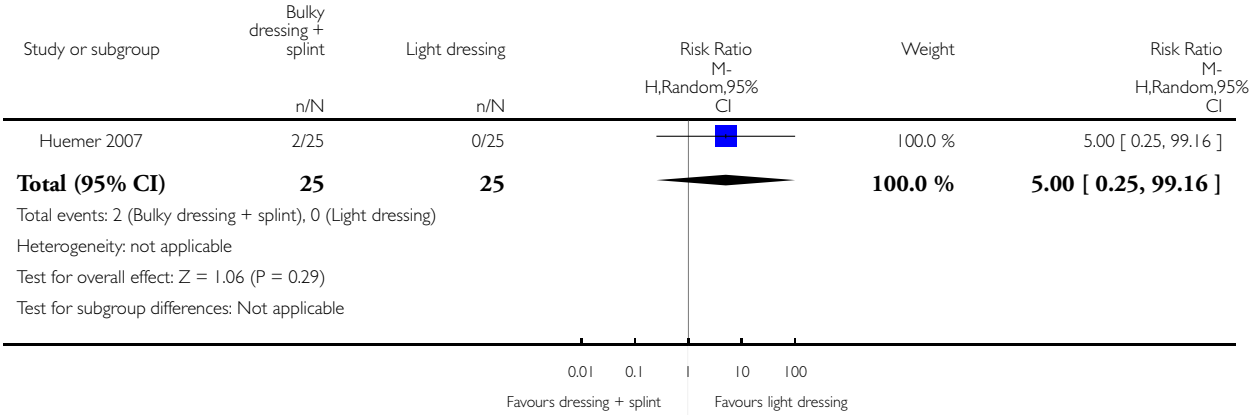


Analysis 6.1. Comparison 6 Bulky dressing plus splint versus light dressing, Outcome 1 Iatrogenic symptom (scar pain).

Review: Rehabilitation following carpal tunnel release

Comparison: 6 Bulky dressing plus splint versus light dressing

Outcome: 1 Iatrogenic symptom (scar pain)



Analysis 6.2. Comparison 6 Bulky dressing plus splint versus light dressing, Outcome 2 Adverse event (median nerve, digital nerve, vascular, tendon complications, delayed wound healing).

Review: Rehabilitation following carpal tunnel release

Comparison: 6 Bulky dressing plus splint versus light dressing

Outcome: 2 Adverse event (median nerve, digital nerve, vascular, tendon complications, delayed wound healing)

Study or subgroup	Bulky dressing + splint n/N	Light dressing n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Huemer 2007	0/25	0/25			Not estimable
Total (95% CI)	**25**	**25**			**Not estimable**

Total events: 0 (Bulky dressing + splint), 0 (Light dressing)

Heterogeneity: not applicable

Test for overall effect: not applicable

Test for subgroup differences: Not applicable

Analysis 7.1. Comparison 7 Contrast bath plus exercise versus contrast bath, Outcome 1 Iatrogenic symptom (swelling).

Review: Rehabilitation following carpal tunnel release

Comparison: 7 Contrast bath plus exercise versus contrast bath

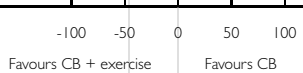
Outcome: 1 Iatrogenic symptom (swelling)

Study or subgroup	Contrast bath + exercise N	Mean(SD)	Contrast bath N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Post treatment							
Janssen 2009	19	496.3 (21.6)	23	505.1 (22.7)		100.0 %	-8.80 [-22.23, 4.63]
Subtotal (95% CI)	**19**		**23**			**100.0 %**	**-8.80 [-22.23, 4.63]**

Heterogeneity: not applicable

Test for overall effect: Z = 1.28 (P = 0.20)

Test for subgroup differences: Not applicable



Analysis 8.1. Comparison 8 Contrast bath plus exercises versus exercise, Outcome 1 Iatrogenic symptom (swelling).

Review: Rehabilitation following carpal tunnel release

Comparison: 8 Contrast bath plus exercises versus exercise

Outcome: 1 Iatrogenic symptom (swelling)

Study or subgroup	Contrast bath + exercise N	Mean(SD)	Exercise N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Post treatment							
Janssen 2009	19	496.3 (21.6)	14	473.1 (32.5)		100.0 %	23.20 [3.60, 42.80]
Subtotal (95% CI)	**19**		**14**			**100.0 %**	**23.20 [3.60, 42.80]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.32 (P = 0.020)							
Test for subgroup differences: Not applicable							

Analysis 9.1. Comparison 9 Contrast bath versus exercise, Outcome 1 Iatrogenic symptom (swelling).

Review: Rehabilitation following carpal tunnel release

Comparison: 9 Contrast bath versus exercise

Outcome: 1 Iatrogenic symptom (swelling)

Study or subgroup	Contrast bath N	Mean(SD)	Exercise N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Post treatment							
Janssen 2009	23	505.1 (22.7)	14	473.1 (32.5)		100.0 %	32.00 [12.61, 51.39]
Subtotal (95% CI)	**23**		**14**			**100.0 %**	**32.00 [12.61, 51.39]**
Heterogeneity: not applicable							
Test for overall effect: Z = 3.23 (P = 0.0012)							
Test for subgroup differences: Not applicable							

Analysis 10.1. Comparison 10 Arnica versus placebo, Outcome 1 Change in impairment measure (grip strength).

Review: Rehabilitation following carpal tunnel release

Comparison: 10 Arnica versus placebo

Outcome: 1 Change in impairment measure (grip strength)

Study or subgroup	Arnica N	Mean(SD)	Placebo N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 1 week post surgery							
Jeffrey 2002	40	74 (38.1)	34	62.6 (28.4)		100.0 %	11.40 [-3.78, 26.58]
Subtotal (95% CI)	**40**		**34**			**100.0 %**	**11.40 [-3.78, 26.58]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.47 (P = 0.14)							
2 At 2 weeks post surgery							
Jeffrey 2002	40	100.2 (63)	34	94.8 (41.7)		100.0 %	5.40 [-18.63, 29.43]
Subtotal (95% CI)	**40**		**34**			**100.0 %**	**5.40 [-18.63, 29.43]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.44 (P = 0.66)							
Test for subgroup differences: Chi^2 = 0.17, df = 1 (P = 0.68), I^2 =0.0%							

Analysis 10.2. Comparison 10 Arnica versus placebo, Outcome 2 Iatrogenic symptom (swelling; % wrist circumference change difference).

Review: Rehabilitation following carpal tunnel release

Comparison: 10 Arnica versus placebo

Outcome: 2 Iatrogenic symptom (swelling; % wrist circumference change difference)

Study or subgroup	Arnica N	Mean(SD)	Placebo N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 1 week post surgery							
Jeffrey 2002	40	1.7 (1.8)	34	1.5 (1.4)		100.0 %	0.20 [-0.53, 0.93]
Subtotal (95% CI)	**40**		**34**			**100.0 %**	**0.20 [-0.53, 0.93]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.54 (P = 0.59)							
2 At 2 weeks post surgery							
Jeffrey 2002	40	1.8 (2.1)	34	2.1 (2.4)		100.0 %	-0.30 [-1.34, 0.74]
Subtotal (95% CI)	**40**		**34**			**100.0 %**	**-0.30 [-1.34, 0.74]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.57 (P = 0.57)							
Test for subgroup differences: Chi^2 = 0.60, df = 1 (P = 0.44), I^2 =0.0%							

Analysis 11.1. Comparison 11 High dose arnica oral tablets versus placebo, Outcome 1 Iatrogenic symptoms (number of patients with no clinician-rated bruising).

Review: Rehabilitation following carpal tunnel release

Comparison: 11 High dose arnica oral tablets versus placebo

Outcome: 1 Iatrogenic symptoms (number of patients with no clinician-rated bruising)

Study or subgroup	High dose arnica n/N	Placebo n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 At 4 days					
Stevinson 2003	5/20	3/22		100.0 %	1.83 [0.50, 6.71]
Subtotal (95% CI)	**20**	**22**		**100.0 %**	**1.83 [0.50, 6.71]**
Total events: 5 (High dose arnica), 3 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.92 (P = 0.36)					
2 At 9 days					
Stevinson 2003	5/20	4/22		100.0 %	1.38 [0.43, 4.42]
Subtotal (95% CI)	**20**	**22**		**100.0 %**	**1.38 [0.43, 4.42]**
Total events: 5 (High dose arnica), 4 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.53 (P = 0.59)					
3 At 14 days					
Stevinson 2003	6/20	6/22		100.0 %	1.10 [0.42, 2.86]
Subtotal (95% CI)	**20**	**22**		**100.0 %**	**1.10 [0.42, 2.86]**
Total events: 6 (High dose arnica), 6 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.20 (P = 0.85)					

Analysis 11.2. Comparison 11 High dose arnica oral tablets versus placebo, Outcome 2 Adverse effects.

Review: Rehabilitation following carpal tunnel release

Comparison: 11 High dose arnica oral tablets versus placebo

Outcome: 2 Adverse effects

Study or subgroup	High dose arnica n/N	Placebo n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 Arnica 30C vs placebo					
Stevinson 2003	3/20	3/20		100.0 %	1.00 [0.23, 4.37]
Subtotal (95% CI)	**20**	**20**		**100.0 %**	**1.00 [0.23, 4.37]**
Total events: 3 (High dose arnica), 3 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.0 (P = 1.0)					

Analysis 12.1. Comparison 12 Low dose arnica tablets versus placebo, Outcome 1 Iatrogenic symptoms (number of patients with no clinician-rated bruising).

Review: Rehabilitation following carpal tunnel release

Comparison: 12 Low dose arnica tablets versus placebo

Outcome: 1 Iatrogenic symptoms (number of patients with no clinician-rated bruising)

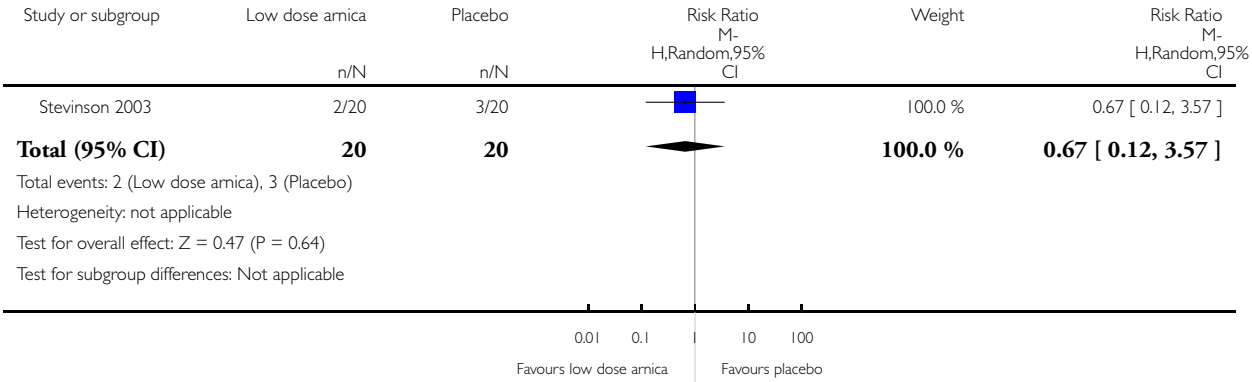
Study or subgroup	Low dose arnica n/N	Placebo n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 At 4 days					
Stevinson 2003	5/20	3/22		100.0 %	1.83 [0.50, 6.71]
Subtotal (95% CI)	**20**	**22**		**100.0 %**	**1.83 [0.50, 6.71]**
Total events: 5 (Low dose arnica), 3 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.92 (P = 0.36)					
2 At 9 days					
Stevinson 2003	3/20	4/22		100.0 %	0.83 [0.21, 3.24]
Subtotal (95% CI)	**20**	**22**		**100.0 %**	**0.83 [0.21, 3.24]**
Total events: 3 (Low dose arnica), 4 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.28 (P = 0.78)					
3 At 14 days					
Stevinson 2003	4/20	6/20		100.0 %	0.67 [0.22, 2.01]
Subtotal (95% CI)	**20**	**20**		**100.0 %**	**0.67 [0.22, 2.01]**
Total events: 4 (Low dose arnica), 6 (Placebo)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.72 (P = 0.47)					
Test for subgroup differences: Chi^2 = 1.42, df = 2 (P = 0.49), I^2 =0.0%					

Analysis 12.2. Comparison 12 Low dose arnica tablets versus placebo, Outcome 2 Adverse events.

Review: Rehabilitation following carpal tunnel release

Comparison: 12 Low dose arnica tablets versus placebo

Outcome: 2 Adverse events

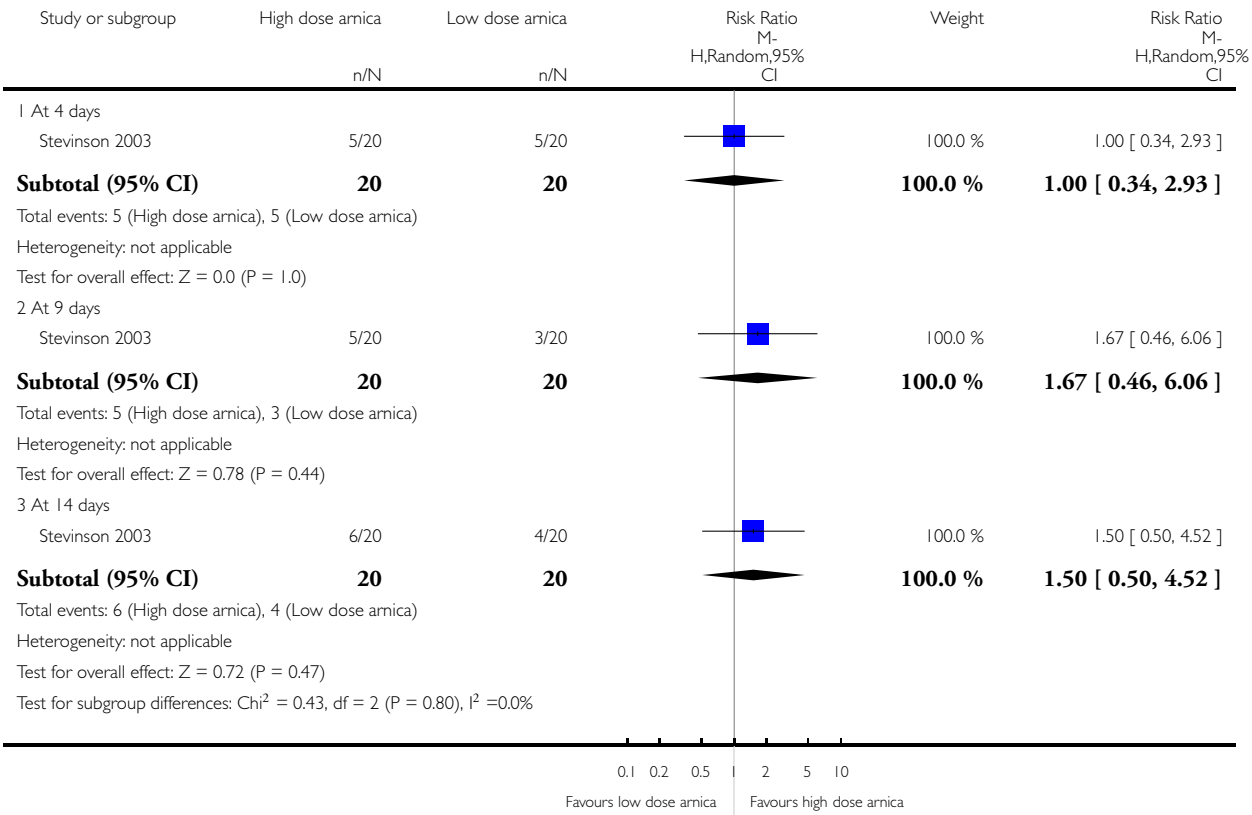


Analysis 13.1. Comparison 13 High dose versus low dose oral arnica tablets, Outcome 1 Iatrogenic symptoms (number of patients with no clinician-rated bruising).

Review: Rehabilitation following carpal tunnel release

Comparison: 13 High dose versus low dose oral arnica tablets

Outcome: 1 Iatrogenic symptoms (number of patients with no clinician-rated bruising)



Analysis 13.2. Comparison 13 High dose versus low dose oral arnica tablets, Outcome 2 Adverse events.

Review: Rehabilitation following carpal tunnel release

Comparison: 13 High dose versus low dose oral arnica tablets

Outcome: 2 Adverse events

Study or subgroup	High dose arnica n/N	Low dose arnica n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Stevinson 2003	3/20	2/20		100.0 %	1.50 [0.28, 8.04]
Total (95% CI)	**20**	**20**		**100.0 %**	**1.50 [0.28, 8.04]**

Total events: 3 (High dose arnica), 2 (Low dose arnica)

Heterogeneity: not applicable

Test for overall effect: Z = 0.47 (P = 0.64)

Test for subgroup differences: Not applicable

Analysis 14.1. Comparison 14 Multimodal hand therapy versus normal activities/exercise, Outcome 1 Long-term improvement in functional ability (BCTQ Functional Status Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 14 Multimodal hand therapy versus normal activities/exercise

Outcome: 1 Long-term improvement in functional ability (BCTQ Functional Status Score)

Study or subgroup	Multimodal hand therapy N	Mean(SD)	No formal therapy N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 DASH at 6 months post surgery							
Pomerance 2007	73	19 (17)	77	18 (17)		100.0 %	1.00 [-4.44, 6.44]
Subtotal (95% CI)	**73**		**77**			**100.0 %**	**1.00 [-4.44, 6.44]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.36 (P = 0.72)

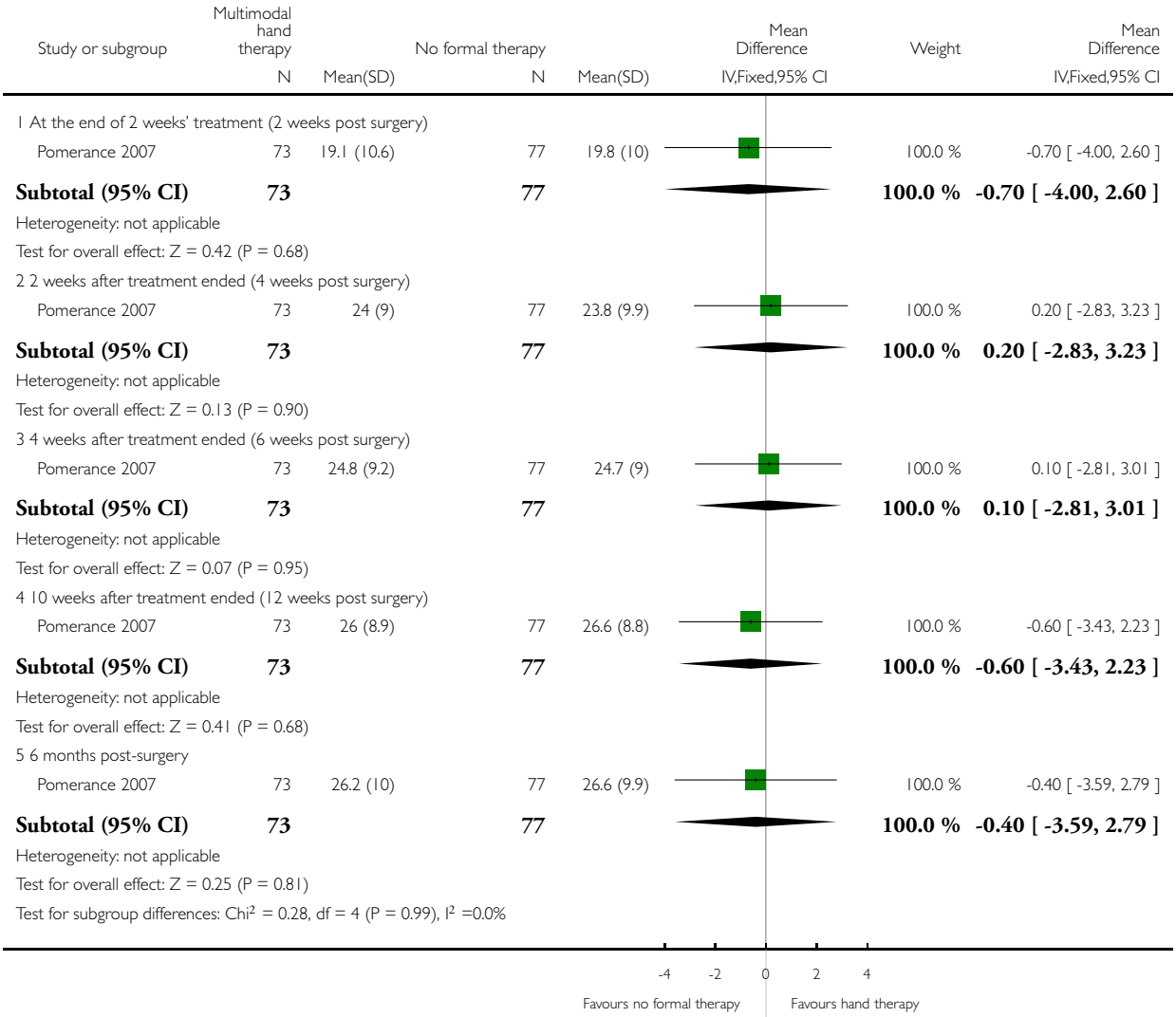
Test for subgroup differences: Not applicable

Analysis 14.2. Comparison 14 Multimodal hand therapy versus normal activities/exercise, Outcome 2 Change in impairment measure (grip strength).

Review: Rehabilitation following carpal tunnel release

Comparison: 14 Multimodal hand therapy versus normal activities/exercise

Outcome: 2 Change in impairment measure (grip strength)

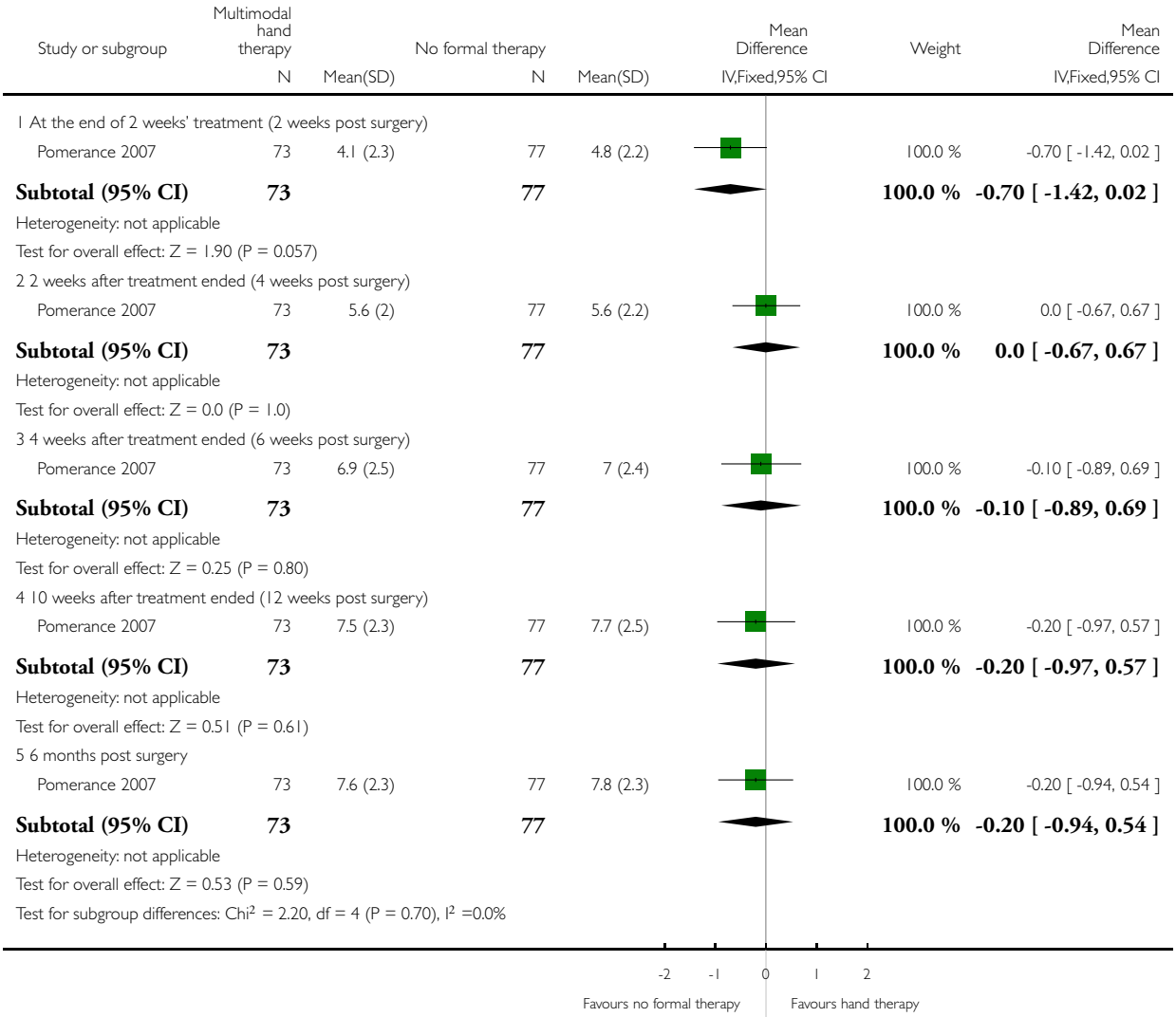


Analysis 14.3. Comparison 14 Multimodal hand therapy versus normal activities/exercise, Outcome 3 Change in impairment measure (lateral pinch strength).

Review: Rehabilitation following carpal tunnel release

Comparison: 14 Multimodal hand therapy versus normal activities/exercise

Outcome: 3 Change in impairment measure (lateral pinch strength)



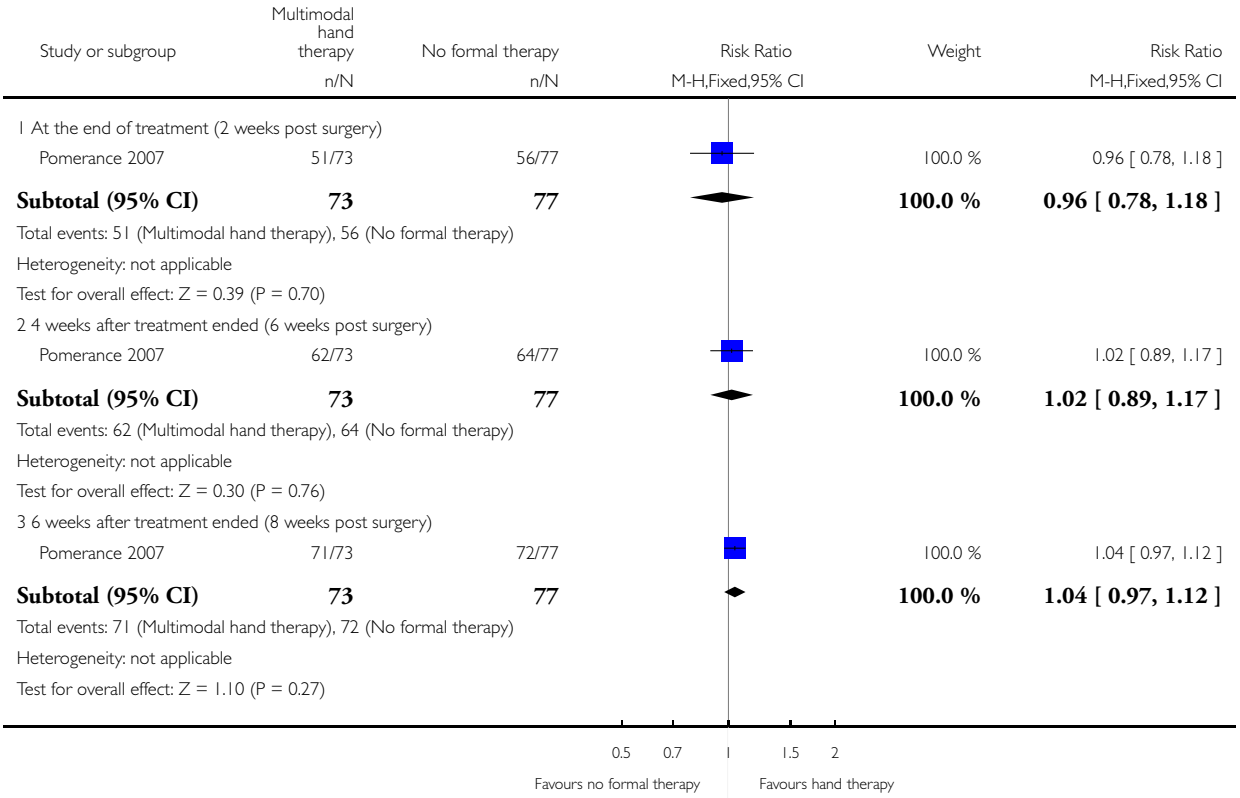
Analysis 14.4. Comparison 14 Multimodal hand therapy versus normal activities/exercise, Outcome 4 Return to normal occupations.

Review: Rehabilitation following carpal tunnel release

Comparison: 14 Multimodal hand therapy versus normal activities/exercise

Outcome: 4 Return to normal occupations

Study or subgroup	Multimodal hand therapy n/N	No formal therapy n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
1 At the end of treatment (2 weeks post surgery)					
Pomerance 2007	51/73	56/77		100.0 %	0.96 [0.78, 1.18]
Subtotal (95% CI)	**73**	**77**		**100.0 %**	**0.96 [0.78, 1.18]**
Total events: 51 (Multimodal hand therapy), 56 (No formal therapy)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.39 (P = 0.70)					
2 4 weeks after treatment ended (6 weeks post surgery)					
Pomerance 2007	62/73	64/77		100.0 %	1.02 [0.89, 1.17]
Subtotal (95% CI)	**73**	**77**		**100.0 %**	**1.02 [0.89, 1.17]**
Total events: 62 (Multimodal hand therapy), 64 (No formal therapy)					
Heterogeneity: not applicable					
Test for overall effect: Z = 0.30 (P = 0.76)					
3 6 weeks after treatment ended (8 weeks post surgery)					
Pomerance 2007	71/73	72/77		100.0 %	1.04 [0.97, 1.12]
Subtotal (95% CI)	**73**	**77**		**100.0 %**	**1.04 [0.97, 1.12]**
Total events: 71 (Multimodal hand therapy), 72 (No formal therapy)					
Heterogeneity: not applicable					
Test for overall effect: Z = 1.10 (P = 0.27)					



Analysis 14.5. Comparison 14 Multimodal hand therapy versus normal activities/exercise, Outcome 5 Adverse effects.

Review: Rehabilitation following carpal tunnel release

Comparison: 14 Multimodal hand therapy versus normal activities/exercise

Outcome: 5 Adverse effects

Study or subgroup	Multimodal hand therapy n/N	No formal therapy n/N	Risk Ratio M-H,Fixed,95% CI	Weight	Risk Ratio M-H,Fixed,95% CI
Pomerance 2007	1/73	2/77		100.0 %	0.53 [0.05, 5.69]
Total (95% CI)	**73**	**77**		**100.0 %**	**0.53 [0.05, 5.69]**

Total events: 1 (Multimodal hand therapy), 2 (No formal therapy)

Heterogeneity: not applicable

Test for overall effect: Z = 0.53 (P = 0.60)

Test for subgroup differences: Not applicable

Analysis 15.1. Comparison 15 Desensitisation therapy (as part of multiple interventions) versus no treatment, Outcome 1 Long-term improvement in functional ability (BCTQ Functional Status Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 15 Desensitisation therapy (as part of multiple interventions) versus no treatment

Outcome: 1 Long-term improvement in functional ability (BCTQ Functional Status Score)

Study or subgroup	Desensitisation N	Mean(SD)	No treatment N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 12 weeks post surgery							
Powell 2003	13	1.35 (0.47)	14	1.38 (0.49)		100.0 %	-0.03 [-0.39, 0.33]
Total (95% CI)	**13**		**14**			**100.0 %**	**-0.03 [-0.39, 0.33]**

Heterogeneity: not applicable

Test for overall effect: Z = 0.16 (P = 0.87)

Test for subgroup differences: Not applicable

Analysis 15.2. Comparison 15 Desensitisation therapy (as part of multiple interventions) versus no treatment, Outcome 2 Short-term improvement in functional ability (BCTQ Functional Status Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 15 Desensitisation therapy (as part of multiple interventions) versus no treatment

Outcome: 2 Short-term improvement in functional ability (BCTQ Functional Status Score)

Study or subgroup	Desensitisation N	Mean(SD)	No treatment N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 3 weeks post surgery							
Powell 2003	13	2.05 (0.56)	14	2.35 (0.67)		100.0 %	-0.30 [-0.76, 0.16]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**-0.30 [-0.76, 0.16]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.27 (P = 0.21)							
2 At 6 weeks post surgery							
Powell 2003	13	1.63 (0.49)	14	1.61 (0.49)		100.0 %	0.02 [-0.35, 0.39]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**0.02 [-0.35, 0.39]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.11 (P = 0.92)							
Test for subgroup differences: Chi^2 = 1.12, df = 1 (P = 0.29), I^2 =10%							

Analysis 15.3. Comparison 15 Desensitisation therapy (as part of multiple interventions) versus no treatment, Outcome 3 Change in CTS symptoms (pain or discomfort).

Review: Rehabilitation following carpal tunnel release

Comparison: 15 Desensitisation therapy (as part of multiple interventions) versus no treatment

Outcome: 3 Change in CTS symptoms (pain or discomfort)

Study or subgroup	Desensitisation N	Mean(SD)	No treatment N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 3 weeks post surgery							
Powell 2003	13	19.2 (15.4)	14	32.5 (21.4)		100.0 %	-13.30 [-27.29, 0.69]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**-13.30 [-27.29, 0.69]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.86 (P = 0.062)							
2 At 6 weeks post surgery							
Powell 2003	13	19.5 (14.6)	14	28.9 (23.1)		100.0 %	-9.40 [-23.87, 5.07]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**-9.40 [-23.87, 5.07]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.27 (P = 0.20)							
3 At 12 weeks post surgery							
Powell 2003	13	20.8 (27.3)	14	15.9 (24.4)		100.0 %	4.90 [-14.69, 24.49]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**4.90 [-14.69, 24.49]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.49 (P = 0.62)							
Test for subgroup differences: Chi^2 = 2.25, df = 2 (P = 0.32), I^2 =11%							

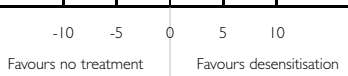
Analysis 15.4. Comparison 15 Desensitisation therapy (as part of multiple interventions) versus no treatment, Outcome 4 Change in impairment measure (grip strength).

Review: Rehabilitation following carpal tunnel release

Comparison: 15 Desensitisation therapy (as part of multiple interventions) versus no treatment

Outcome: 4 Change in impairment measure (grip strength)

Study or subgroup	Desensitisation N	Mean(SD)	No treatment N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 3 weeks post surgery							
Powell 2003	13	9.11 (4.37)	14	8.7 (6.97)		100.0 %	0.41 [-3.95, 4.77]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**0.41 [-3.95, 4.77]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.18 (P = 0.85)							
2 At 6 weeks post surgery							
Powell 2003	13	14.6 (7.58)	14	12.8 (7.82)		100.0 %	1.80 [-4.01, 7.61]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**1.80 [-4.01, 7.61]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.61 (P = 0.54)							
3 At 12 weeks post surgery							
Powell 2003	13	18.9 (9.36)	14	19.7 (7.97)		100.0 %	-0.80 [-7.38, 5.78]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**-0.80 [-7.38, 5.78]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.24 (P = 0.81)							
Test for subgroup differences: Chi^2 = 0.34, df = 2 (P = 0.84), I^2 =0.0%							



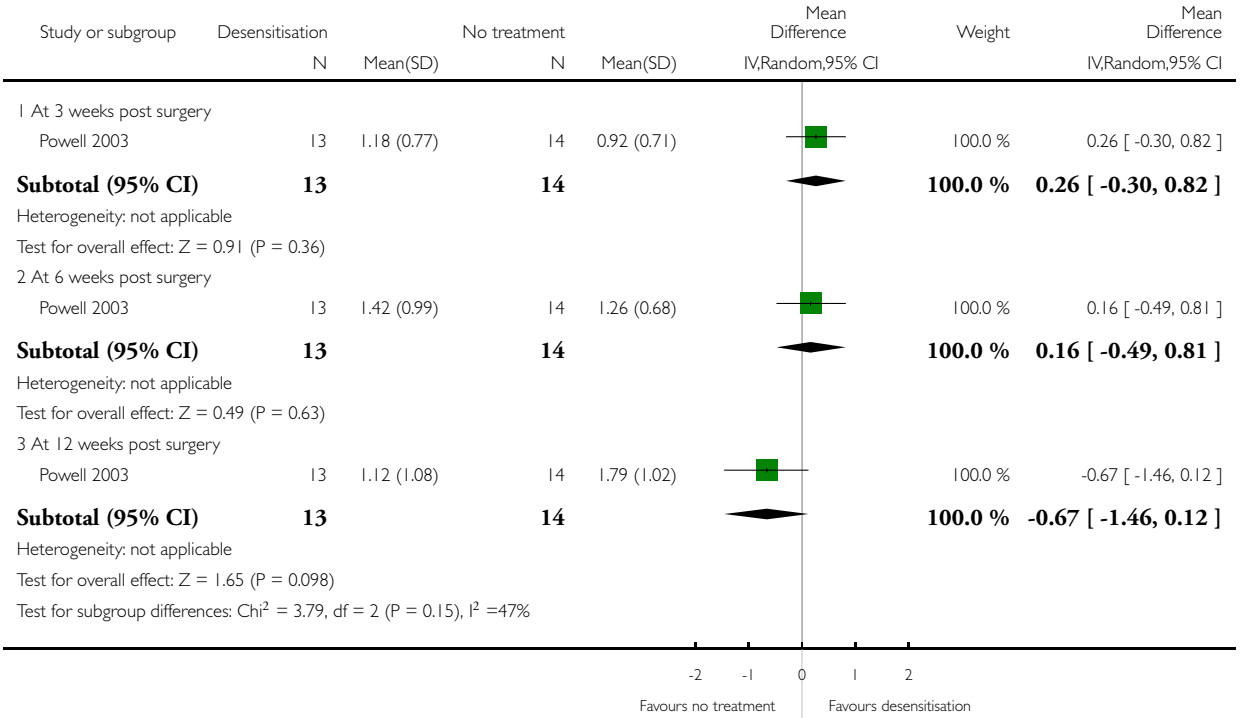
Analysis 15.5. Comparison 15 Desensitisation therapy (as part of multiple interventions) versus no treatment, Outcome 5 Iatrogenic symptoms (scar sensitivity using dolorimetry).

Review: Rehabilitation following carpal tunnel release

Comparison: 15 Desensitisation therapy (as part of multiple interventions) versus no treatment

Outcome: 5 Iatrogenic symptoms (scar sensitivity using dolorimetry)

Study or subgroup	Desensitisation N	Mean(SD)	No treatment N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 3 weeks post surgery							
Powell 2003	13	1.18 (0.77)	14	0.92 (0.71)		100.0 %	0.26 [-0.30, 0.82]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**0.26 [-0.30, 0.82]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.91 (P = 0.36)							
2 At 6 weeks post surgery							
Powell 2003	13	1.42 (0.99)	14	1.26 (0.68)		100.0 %	0.16 [-0.49, 0.81]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**0.16 [-0.49, 0.81]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.49 (P = 0.63)							
3 At 12 weeks post surgery							
Powell 2003	13	1.12 (1.08)	14	1.79 (1.02)		100.0 %	-0.67 [-1.46, 0.12]
Subtotal (95% CI)	**13**		**14**			**100.0 %**	**-0.67 [-1.46, 0.12]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.65 (P = 0.098)							
Test for subgroup differences: Chi^2 = 3.79, df = 2 (P = 0.15), I^2 =47%							



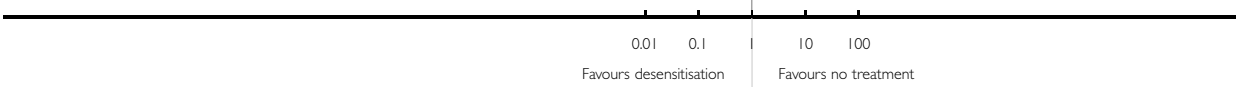
Analysis 15.6. Comparison 15 Desensitisation therapy (as part of multiple interventions) versus no treatment, Outcome 6 Adverse events (wound dehiscence).

Review: Rehabilitation following carpal tunnel release

Comparison: 15 Desensitisation therapy (as part of multiple interventions) versus no treatment

Outcome: 6 Adverse events (wound dehiscence)

Study or subgroup	Desensitisation n/N	No treatment n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Powell 2003	0/13	0/14			Not estimable
Total (95% CI)	**13**	**14**			**Not estimable**
Total events: 0 (Desensitisation), 0 (No treatment)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Test for subgroup differences: Not applicable					



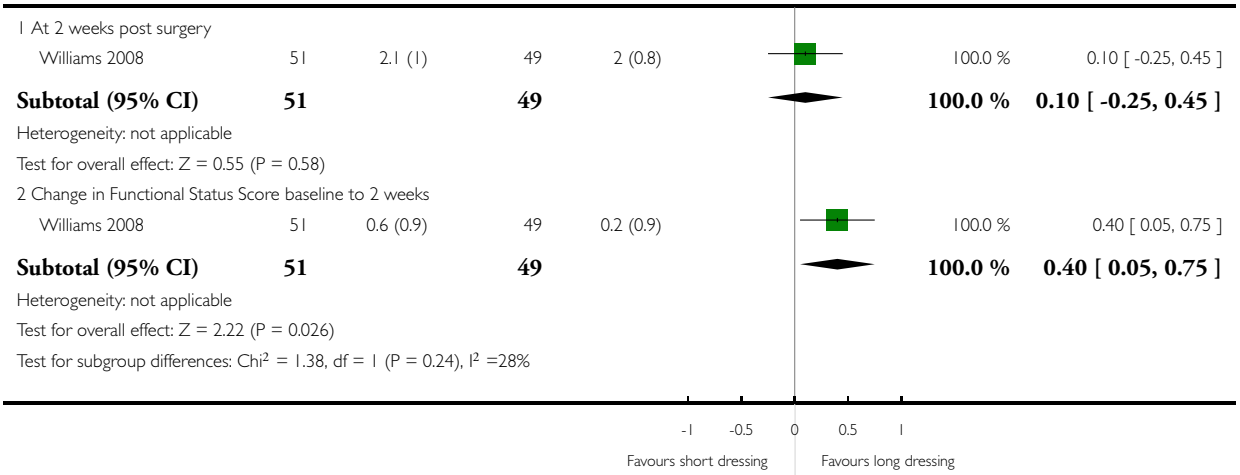
Analysis 16.1. Comparison 16 Short duration dressing versus extended duration dressing, Outcome 1 Short-term improvement in functional ability (BCTQ Functional Status Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 16 Short duration dressing versus extended duration dressing

Outcome: 1 Short-term improvement in functional ability (BCTQ Functional Status Score)

Study or subgroup	Long duration dressing N	Mean(SD)	Short duration dressing N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 2 weeks post surgery							
Williams 2008	51	2.1 (1)	49	2 (0.8)		100.0 %	0.10 [-0.25, 0.45]
Subtotal (95% CI)	**51**		**49**			**100.0 %**	**0.10 [-0.25, 0.45]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.55 (P = 0.58)							
2 Change in Functional Status Score baseline to 2 weeks							
Williams 2008	51	0.6 (0.9)	49	0.2 (0.9)		100.0 %	0.40 [0.05, 0.75]
Subtotal (95% CI)	**51**		**49**			**100.0 %**	**0.40 [0.05, 0.75]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.22 (P = 0.026)							
Test for subgroup differences: Chi^2 = 1.38, df = 1 (P = 0.24), I^2 =28%							

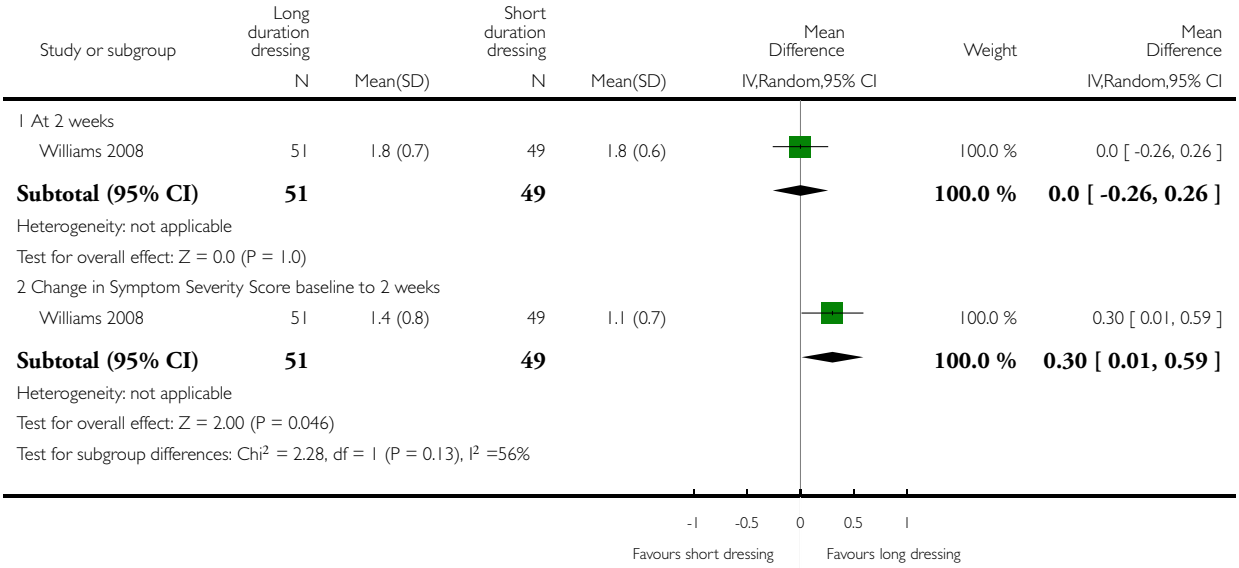


Analysis 16.2. Comparison 16 Short duration dressing versus extended duration dressing, Outcome 2 Change in CTS symptoms (BCTQ Symptom Severity Score).

Review: Rehabilitation following carpal tunnel release

Comparison: 16 Short duration dressing versus extended duration dressing

Outcome: 2 Change in CTS symptoms (BCTQ Symptom Severity Score)



Analysis 16.3. Comparison 16 Short duration dressing versus extended duration dressing, Outcome 3 Change in impairment measure (grip strength).

Review: Rehabilitation following carpal tunnel release

Comparison: 16 Short duration dressing versus extended duration dressing

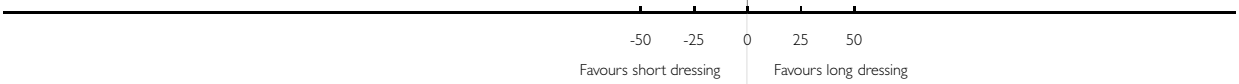
Outcome: 3 Change in impairment measure (grip strength)

Study or subgroup	Long duration dressing N	Mean(SD)	Short duration dressing N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 At 6-12 weeks							
Ritting 2012	36	8.2 (7.7)	30	24.2 (13.9)		100.0 %	-16.00 [-21.57, -10.43]
Total (95% CI)	**36**		**30**			**100.0 %**	**-16.00 [-21.57, -10.43]**

Heterogeneity: not applicable

Test for overall effect: Z = 5.63 (P < 0.00001)

Test for subgroup differences: Not applicable



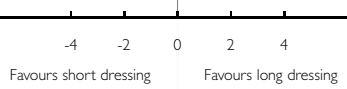
Analysis 16.4. Comparison 16 Short duration dressing versus extended duration dressing, Outcome 4 Change in impairment measure (pinch strength).

Review: Rehabilitation following carpal tunnel release

Comparison: 16 Short duration dressing versus extended duration dressing

Outcome: 4 Change in impairment measure (pinch strength)

Study or subgroup	Long duration dressing N	Mean(SD)	Short duration dressing N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Tip pinch 6-12 weeks							
Ritting 2012	36	4.6 (1.7)	30	5.8 (2.8)		100.0 %	-1.20 [-2.35, -0.05]
Subtotal (95% CI)	**36**		**30**			**100.0 %**	**-1.20 [-2.35, -0.05]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.05 (P = 0.040)							
2 Three point pinch at 6-12 weeks							
Ritting 2012	36	5.3 (1.9)	30	6.4 (2.8)		100.0 %	-1.10 [-2.28, 0.08]
Subtotal (95% CI)	**36**		**30**			**100.0 %**	**-1.10 [-2.28, 0.08]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.83 (P = 0.067)							
3 Lateral pinch at 6-12 weeks							
Ritting 2012	36	6.4 (1.9)	30	7.1 (2.8)		100.0 %	-0.70 [-1.88, 0.48]
Subtotal (95% CI)	**36**		**30**			**100.0 %**	**-0.70 [-1.88, 0.48]**
Heterogeneity: not applicable							
Test for overall effect: Z = 1.16 (P = 0.24)							
Test for subgroup differences: Chi^2 = 0.39, df = 2 (P = 0.82), I^2 =0.0%							



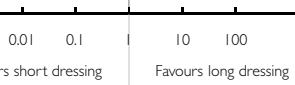
Analysis 16.5. Comparison 16 Short duration dressing versus extended duration dressing, Outcome 5 Adverse event.

Review: Rehabilitation following carpal tunnel release

Comparison: 16 Short duration dressing versus extended duration dressing

Outcome: 5 Adverse event

Study or subgroup	Long duration dressing n/N	Short duration dressing n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Ritting 2012	0/36	0/30			Not estimable
Williams 2008	0/51	0/49			Not estimable
Total (95% CI)	**87**	**79**			**Not estimable**
Total events: 0 (Long duration dressing), 0 (Short duration dressing)					
Heterogeneity: not applicable					
Test for overall effect: not applicable					
Test for subgroup differences: Not applicable					



APPENDICES

Appendix 1. MEDLINE (OvidSP) search strategy

Database: Ovid MEDLINE(R) <1946 to March Week 3 2012>
Search Strategy:

---

1 randomised controlled trial.pt. (322018)
2 controlled clinical trial.pt. (83725)
3 randomized.ab. (227059)
4 placebo.ab. (129364)
5 drug therapy.fs. (1512981)
6 randomly.ab. (164073)
7 trial.ab. (234125)
8 groups.ab. (1081731)
9 or/1-8 (2806662)
10 exp animals/ not humans.sh. (3686007)
11 9 not 10 (2382300)
12 Carpal Tunnel Syndrome/ (6379)
13 carpal tunnel.mp. (7651)
14 or/12-13 (7651)

15 exp REHABILITATION/ (131274)
16 Postoperative Care/ (48938)
17 exp Musculoskeletal Manipulations/ (10919)
18 exp Exercise Movement Techniques/ (4365)
19 exp Physical Therapy Techniques/ (109381)
20 SPLINTS/ (7104)
21 Casts, Surgical/ (7530)
22 (ultrasound or scar$ or desenti$ or rehabilit$ or work or cold therap$ or ice therapy or splint$ or exercis$ or mobili$ or educat$ or activity modification or ergonomic$).mp. (1573897)
23 (immobili$ or hand elevation or sling or strength$ or oedema$ or edema$ or compress$ or massag$ or gliding or thermotherapy or physical therap$ or physiotherap$ or manual therap$ or occupational therap$ or osteopath$ or chiropract$).mp. (532328)
24 pain, postoperative/ (23627)
25 postoperative.tw. (255189)
26 or/15-25 (2359672)
27 11 and 14 and 26 (550)
28 Decompression, Surgical/ (8308)
29 microvascular decompression surgery/ (11)
30 (surgical or epineurotomy or reconstruct$ or release or decompress$ or endoscop$).tw. (1138166)
31 hand surgery.mp. (1544)
32 or/28-31 (1140886)
33 11 and 14 and 26 and 32 (260)

Appendix 2. EMBASE (OvidSP) search strategy

Database: Embase <1980 to 2012 Week 13>
Search Strategy:
---
1 crossover-procedure.sh. (33411)
2 double-blind procedure.sh. (107964)
3 single-blind procedure.sh. (15640)
4 randomised controlled trial.sh. (318960)
5 (random$ or crossover$ or cross over$ or placebo$ or (doubl$ adj blind$) or allocat$).tw,ot. (853185)
6 trial.ti. (127489)
7 or/1-6 (977857)
8 (animal/ or nonhuman/ or animal experiment/) and human/ (1166426)
9 animal/ or nonanimal/ or animal experiment/ (3250362)
10 9 not 8 (2695118)
11 7 not 10 (895859)
12 limit 11 to embase (692354)
13 carpal tunnel syndrome/ (9658)
14 carpal tunnel syndrome.mp. (10407)
15 ((nerve entrapment or nerve compression or entrapment neuropath$) and carpal).mp. (1653)
16 or/13-15 (10511)
17 rehabilitation/ (33215)
18 postoperative care/ (59518)
19 manipulative medicine/ (7541)
20 physiotherapy/ (43845)
21 splint/ (6575)
22 plaster cast/ (7425)
23 postoperative pain/ (35153)
24 (ultrasound or scar$ or desenti$ or rehabilit$ or work or cold therap$ or ice therapy or splint$ or exercis$ or mobili$ or educat$ or activity modification or ergonomic$).mp. (2226089)

25 (immobili$ or hand elevation or sling or strength$ or oedema$ or edema$ or compress$ or massag$ or gliding or thermotherapy or physical therap$ or physiotherap$ or manual therap$ or occupational therap$ or osteopath$ or chiropract$).mp. (749477)
26 postoperative.tw. (317872)
27 exp "bandages and dressings"/ (29066)
28 or/17-27 (3155412)
29 12 and 16 and 28 (379)
30 (hand surgery or surgical or epineurotomy or reconstruct$ or release or endoscop$ or octr or ectr).mp. (1807281)
31 exp decompression surgery/ (27960)
32 30 or 31 (1822354)
33 12 and 16 and 28 and 32 (166)
34 remove duplicates from 33 (166)

Appendix 3. AMED (OvidSP) search strategy

Database: AMED (Allied and Complementary Medicine) <1985 to March 2012>
Search Strategy:
---
1 Randomized controlled trials/ (1510)
2 Random allocation/ (302)
3 Double blind method/ (428)
4 Single-Blind Method/ (25)
5 exp Clinical Trials/ (3163)
6 (clin$ adj25 trial$).tw. (5381)
7 ((singl$ or doubl$ or treb$ or trip$) adj25 (blind$ or mask$ or dummy)).tw. (2204)
8 placebos/ (517)
9 placebo$.tw. (2484)
10 random$.tw. (12562)
11 research design/ (1668)
12 Prospective Studies/ (439)
13 meta analysis/ (106)
14 (meta?analys$ or systematic review$).tw. (1785)
15 control$.tw. (27180)
16 (multicenter or multicentre).tw. (716)
17 ((study or studies or design$) adj25 (factorial or prospective or intervention or crossover or cross-over or quasi-experiment$)).tw. (9588)
18 or/1-17 (41894)
19 carpal tunnel syndrome/ or carpal tunnel syndrome.tw. (444)
20 ((nerve entrapment or nerve compression or entrapment neuropath$) and carpal).mp. (53)
21 or/19-20 (445)
22 rehabilitation/ (36521)
23 postoperative care/ (1092)
24 exp musculoskeletal manipulations/ (4239)
25 physical therapy modalities/ or exp exercise movement techniques/ (2751)
26 exp physical therapy modalities/ (17399)
27 splints/ (99)
28 (ultrasound or scar$ or rehabilit$ or work or cold therap$ or ice therapy or splint$ or exercis$ or mobili$ or educat$ or activity modification or ergonomic$).mp. (80839)
29 (immobili$ or hand elevation or sling or strength$ or oedema$ or edema$ or compress$ or massag$ or gliding or thermotherapy or physical therap$ or physiotherap$ or manual therap$ or occupational therap$ or osteopath$ or chiropract$).mp. (48973)
30 pain postoperative/ (150)
31 postoperative.tw. (3579)
32 or/22-31 (114068)

33 (hand surgery or surgical or epineurotomy or reconstruct$ or release or decompress$ or endoscop$ or octr or ectr).mp. (7555)
34 18 and 21 and 32 and 33 (20)
35 remove duplicates from 34 (20)

Appendix 4. PsycINFO (OvidSP) search strategy

Database: PsycINFO <1806 to March Week 4 2012>
Search Strategy:
---
1 (random$ or rct or cct or factorial$ or crossover$ or cross over$ or cross-over$ or placebo$ or (doubl$ adj blind$) or (singl$ adj blind$) or assign$ or allocat$ or volunteer$).tw. (209229)
2 carpal tunnel syndrome.mp. (215)
3 (ultrasound or scar$ or desenti$ or rehabilit$ or work or cold therap$ or ice therapy or splint$ or exercis$ or mobili$ or educat$ or activity modification or ergonomic$).mp. (740252)
4 (immobili$ or hand elevation or sling or strength$ or oedema$ or edema$ or compress$ or massag$ or gliding or thermotherapy or physical therap$ or physiotherap$ or manual therap$ or occupational therap$ or osteopath$ or chiropract$).mp. (90953)
5 (postoperative care or manipulation or splint$1).mp. (17139)
6 or/3-5 (817231)
7 (decompression or surgical or epineurotomy or reconstruct$ or release or decompress$ or endoscop$ or octr or ectr).mp. (48446)
8 1 and 2 and 6 and 7 (2)

Appendix 5. CINAHL Plus (EBSCOhost) search strategy

Print Search History
Tuesday, April 03, 2012 10:32:07 AM

S30 S18 and S24 and S28 and S29 81
S29 hand surgery or surgical or epineurotomy or reconstruct* or release or endoscop* or octr or ectr 116724
S28 S25 or S26 or S27 819565
S27 bandage* or dressing* or immobili or hand elevation or sling or strength* or oedema* or edema* or compress* or massag* or gliding or thermotherapy or physical therap* or physiotherap* or manual therap* or occupational therap* or osteopath* or chiropract* or postoperative 215056
S26 ultrasound or scar* or desenti* or rehabilit* or work or cold therap or ice therapy or splint* or exercis* or mobili* or educat* or activity modification or ergonomic* 672569
S25 (MH "Manual Therapy+") OR (MH "Massage") OR (MH "Manipulation, Osteopathic") OR (MH "Rehabilitation") OR (MH "Hand Therapy") OR (MH "Physical Therapy") OR (MH "Cryotherapy") 56183
S24 s19 or s20 or s21 or s22 or s23 1866
S23 entrapment neuropath* and carpal 43
S22 nerve compression and carpal 145
S21 nerve entrapment and carpal 53
S20 carpal tunnel syndrome 1859
S19 (MH "Carpal Tunnel Syndrome") 1637
S18 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17 529231
S17 ABAB design* 73
S16 TI random* or AB random* 108199
S15 (TI (cross?over or placebo* or control* or factorial or sham? or dummy)) or (AB (cross?over or placebo* or control* or factorial or sham? or dummy)) 223769
S14 (TI (clin* or intervention* or compar* or experiment* or preventive or therapeutic) or AB (clin* or intervention* or compar* or experiment* or preventive or therapeutic)) and (TI (trial*) or AB (trial*)) 75278
S13 (TI (meta?analys* or systematic review*)) or (AB (meta?analys* or systematic review*)) 21661
S12 (TI (single* or doubl* or tripl* or trebl*) or AB (single* or doubl* or tripl* or trebl*)) and (TI (blind* or mask*) or AB (blind* or mask*)) 17681

S11 PT ("clinical trial" or "systematic review") 100340
S10 (MH "Factorial Design") 807
S9 (MH "Concurrent Prospective Studies") or (MH "Prospective Studies") 174179
S8 (MH "Meta Analysis") 13791
S7 (MH "Solomon Four-Group Design") or (MH "Static Group Comparison") 30
S6 (MH "Quasi-Experimental Studies") 5297
S5 (MH "Placebos") 7438
S4 (MH "Double-Blind Studies") or (MH "Triple-Blind Studies") 23817
S3 (MH "Clinical Trials+") 139220
S2 (MH "Crossover Design") 9059
S1 (MH "Random Assignment") or (MH "Random Sample") or (MH "Simple Random Sample") or (MH "Stratified Random Sample") or (MH "Systematic Random Sample") 55783

Appendix 6. LILACS search strategy

carpal tunnel syndrome [Words] and (Rehabilitation or postoperative care or musculoskeletal manipulation$ or movement technique$ or physical therapy or splint$ or cast or casts or ultrasound or scar or desenti$ or rehabilit$ or work or cold therap$ or ice therapy or splint$ or exercis$ or mobili$ or educat$ or activity modification or ergonomic$ or immobili$ or hand elevation or sling or strength$ or oedema$ or edema$ or compress$ or massag$ or gliding or thermotherapy or physical therap$ or physiotherap$ or manual therap$ or occupational therap$ or osteopath$ or chiropract$) and (decompression surgicalor surgical decompression or decompression surgery or surgical or epineurotomy or reconstruct$ or release or decompress$ or endoscop$ or hand surgery) [Words] and ((Pt randomised controlled trial OR Pt controlled clinical trial OR Mh randomised controlled trials OR Mh random allocation OR Mh double-blind method OR Mh single-blind method) AND NOT (Ct animal AND NOT (Ct human and Ct animal)) OR (Pt clinical trial OR Ex E05.318.760.535$ OR (Tw clin$ AND (Tw trial$ OR Tw ensa$ OR Tw estud$ OR Tw experim$ OR Tw investiga$)) OR ((Tw singl$ OR Tw simple$ OR Tw doubl$ OR Tw doble$ OR Tw duplo$ OR Tw trebl$ OR Tw trip$) AND (Tw blind$ OR Tw cego$ OR Tw ciego$ OR Tw mask$ OR Tw mascar$)) OR Mh placebos OR Tw placebo$ OR (Tw random$ OR Tw randon$ OR Tw casual$ OR Tw acaso$ OR Tw azar OR Tw aleator$) OR Mh research design) AND NOT (Ct animal AND NOT (Ct human and Ct animal)) OR (Ct comparative study OR Ex E05.337$ OR Mh follow-up studies OR Mh prospective studies OR Tw control$ OR Tw prospectiv$ OR Tw volunt$ OR Tw volunteer$) AND NOT (Ct animal AND NOT (Ct human and Ct animal))) [Words]

Appendix 7. CENTRAL search strategy

#1 "Carpal Tunnel Syndrome"
#2 ("nerve entrapment" OR "nerve compression" OR "entrapment neuropath*")
#3 "median nerve entrapment"
#4 (#1 OR #2 OR #3)
#5 MeSH descriptor Rehabilitation explode all trees
#6 MeSH descriptor Musculoskeletal Manipulations explode all trees
#7 MeSH descriptor Physical Therapy Modalities explode all trees
#8 MeSH descriptor Exercise Movement Techniques explode all trees
#9 "postoperative care" or splint or ultrasound or scar or rehabilit* or "cold therapt" or "ice therapy" or exercise or mobili* educat* or "activity modification" or ergonomic*
#10 immobili* or "hand elevation" or sling or strength* or oedema or edema or compress* or massage or gliding or thermotherapy or "physical theapy" or physiotherapy or "manual therapy" or "occupational therapy" or osteopath* or chiropract* or postoperative
#11 surgical NEAR/2 cast or surgical NEAR/2 casts
#12 (#5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11)
#13 (#4 AND #12)
#14 "hand surgery" or surgical or epineurotomy or decompress* or reconstruct* or release or endoscop* or octr or ectr
#15 (#13 AND #14)

Appendix 8. PEDRO search strategy

#1 “Carpal Tunnel”

Appendix 9. Glossary

Bowstringing of the tendons - tendon takes the shortest route across the wrist joint
Cryotherapy - therapeutic intervention using ice
Double crush syndrome - compression of a nerve at more than one site (eg. at the neck and the wrist)
Epineurotonomy - division of a thickened nerve sheath or epineurum
Iatrogenic symptoms - inadvertent adverse complication resulting from medical treatment
Internal neurolysis - removal of scar tissue from the nerve
Palmar arch injury - injury to an artery in the hand
Paraesthesia - sensation of tingling or burning
Pillar pain - tenderness on the base of the palm superficial to the carpal tunnel
Synovectomy - surgical removal of a part of the synovial membrane (lining) of a joint

CONTRIBUTIONS OF AUTHORS

SUSAN PETERS (SP) was involved in the following aspects of the review: design of the review (in collaboration with the previous protocol authors); undertaking the search of studies (in addition to Angela Gunn of the Cochrane Neuromuscular Disease Group); screening the search results (independently of, but in addition to MP); organising retrieval of papers; screening retrieved papers against inclusion/exclusion criteria (independently of, but in addition to MP); appraising the risk of bias of papers (independently of, but in addition to MP); data extraction from included studies (independently of, but in addition to MP); writing to study investigators for additional information; summarising the risk of bias of the studies; compiling the summary of comparisons, table of included, excluded, awaiting and ongoing studies; entering data into RevMan; performing analysis of data; interpreting the findings; writing of the review; final approval of the version to be published.

MATTHEW PAGE (MP) was involved in the following aspects of the review: design of the review (in collaboration with the previous protocol authors); screening the search results (independently of, but in addition to SP); screening retrieved papers against inclusion/exclusion criteria (independently of, but in addition to SP); appraising the risk of bias of papers (independently of, but in addition to SP); data extraction from included studies (independently of, but in addition to SP); entering data into RevMan; performing analysis of data; interpreting the findings; writing of the review; final approval of the version to be published.

VENERINA JOHNSON (VJ) was involving in the following aspects of the review: design of the review (in collaboration with the previous protocol authors); designated third assessor for disputes; interpreting the findings; writing of the review; final approval of the version to be published.

MICHEL COPPIETERS (MC) was involved in the following aspects of the review: design of the review (in collaboration with the previous protocol authors); interpreting the findings; writing of the review; final approval of the version to be published.

MARK ROSS (MR) was involved in the following aspects of the review: interpreting the findings; writing of the review; final approval of the version to be published.

DECLARATIONS OF INTEREST

The authors have no known conflicts of interest.

SOURCES OF SUPPORT

Internal sources

- Brisbane Hand and Upper Limb Rehabilitation Institute, Brisbane, Australia.
- Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland, Australia.

External sources

- No external sources of support were provided for this review, Not specified.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

'Risk of bias' methods were updated and outcomes for inclusion in 'Summary of findings' tables added. Background information was updated to reflect changes in the literature since the protocol was published in 2003. We updated references to previous versions of RevMan software. 'Types of interventions' included in this review were clarified to include rehabilitation interventions, and exclude interventions related to postoperative analgesia. Outcomes from the original protocol (O'Connor 2003) were modified for the review to be consistent with other Cochrane reviews on CTS (Marshall 2007; Scholten 2007; Verdugo 2008; Page 2012a; Page 2012b; Page 2012c; O'Connor 2012). In addition, secondary outcomes regarding return to work were included. Subgroup analyses were amended to reflect current surgical interventions. 'Timing of rehabilitation' and 'other concomitant conditions' subgroup analyses were removed from the review. The sections 'assessment of heterogeneity' and 'sensitivity analysis' have been amended since the protocol was formulated. Sections on 'unit of analysis' and 'assessment of reporting biases' were added.

Denise O'Connor and Cathy Dabourn withdrew from authorship following publication of the protocol and a new team of authors amended the existing protocol as indicated in this review following the guidelines in the Cochrane Handbook (Higgins 2011).

INDEX TERMS

Medical Subject Headings (MeSH)

Carpal Tunnel Syndrome [*rehabilitation; *surgery]; Outcome Assessment (Health Care); Postoperative Care [*methods]; Randomized Controlled Trials as Topic; Rehabilitation [methods]

MeSH check words

Humans