Management of Carpal Tunnel Syndrome

Evidence-Based Clinical Practice Guideline

Adopted by:
The American Academy of Orthopaedic Surgeons Board of Directors
February 29, 2016

Endorsed by:

Please cite this guideline as:
Disclaimer

This Clinical Practice Guideline was developed by an AAOS physician volunteer Guideline development group based on a systematic review of the current scientific and clinical information and accepted approaches to treatment and/or diagnosis. This Clinical Practice Guideline is not intended to be a fixed protocol, as some patients may require more or less treatment or different means of diagnosis. Clinical patients may not necessarily be the same as those found in a clinical trial. Patient care and treatment should always be based on a clinician’s independent medical judgment, given the individual patient’s clinical circumstances.

Disclosure Requirement
In accordance with AAOS policy, all individuals whose names appear as authors or contributors to Clinical Practice Guideline filed a disclosure statement as part of the submission process. All panel members provided full disclosure of potential conflicts of interest prior to voting on the recommendations contained within this Clinical Practice Guidelines.

Funding Source
This Clinical Practice Guideline was funded exclusively by the American Academy of Orthopaedic Surgeons who received no funding from outside commercial sources to support the development of this document.

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Published 2/29/16 by the American Academy of Orthopaedic Surgeons
9400 W Higgins Road
Rosemont, IL 60018
First Edition
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I. SUMMARY OF RECOMMENDATIONS

The following is a summary of the recommendations of the AAOS Clinical Practice Guideline on the Management of Carpal Tunnel Syndrome. All readers of this summary are strongly urged to consult the full guideline and evidence report for this information. We are confident that those who read the full guideline and evidence report will see that the recommendations were developed using systematic evidence-based processes designed to combat bias, enhance transparency, and promote reproducibility.

This summary of recommendations is not intended to stand alone. Treatment decisions should be made in light of all circumstances presented by the patient. Treatments and procedures applicable to the individual patient rely on mutual communication between patient, physician, and other healthcare practitioners.

Strength of Recommendation Descriptions

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<th>Strength</th>
<th>Overall Strength of Evidence</th>
<th>Description of Evidence Quality</th>
<th>Strength Visual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Strong</td>
<td>Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.</td>
<td>★★★★★</td>
</tr>
<tr>
<td>Moderate</td>
<td>Moderate</td>
<td>Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.</td>
<td>★★★★☆</td>
</tr>
<tr>
<td>Limited</td>
<td>Low Strength Evidence or Conflicting Evidence</td>
<td>Evidence from two or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for against the intervention or diagnostic or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.</td>
<td>★★★☆☆</td>
</tr>
<tr>
<td>Consensus</td>
<td>No Evidence</td>
<td>There is no supporting evidence. In the absence of reliable evidence, the guideline development group is making a recommendation based on their clinical opinion. Consensus statements are published in a separate, complimentary document.</td>
<td>★★★☆☆</td>
</tr>
</tbody>
</table>
**OBSERVATION**

Strong evidence supports Thenar atrophy is strongly associated with ruling-in carpal tunnel syndrome, but poorly associated with ruling-out carpal tunnel syndrome.

Strength of Recommendation: Strong Evidence ★★★★★

*Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.*

**PHYSICAL SIGNS**

Strong evidence supports not using the Phalen Test, Tinel Sign, Flick Sign, or Upper limb neurodynamic/nerve tension test (ULNT) criterion A/B as independent physical examination maneuvers to diagnose carpal tunnel syndrome, because alone, each has a poor or weak association with ruling-in or ruling-out carpal tunnel syndrome.

Strength of Recommendation: Strong Evidence ★★★★★

*Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.*

**MANEUVERS**

Moderate evidence supports not using the following as independent physical examination maneuvers to diagnose carpal tunnel syndrome, because alone, each has a poor or weak association with ruling-in or ruling-out carpal tunnel syndrome:

- Carpal Compression test
- Reverse Phalen Test
- Thenar Weakness or Thumb Abduction Weakness or Abductor Pollicis Brevis Manual Muscle Testing
- 2-point discrimination
- Semmes-Weinstein Monofilament Test
- CTS-Relief Maneuver (CTS-RM)
- Pin Prick Sensory Deficit; thumb or index or middle finger
- ULNT Criterion C
- Tethered median nerve stress test
- Vibration perception – tuning fork
- Scratch collapse test
- Luthy sign
- Pinwheel

Strength of Recommendation: Moderate Evidence ★★★★☆

*Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.*
HISTORY INTERVIEW TOPICS

Moderate evidence supports not using the following as independent history interview topics to diagnose carpal tunnel syndrome, because alone, each has a poor or weak association with ruling-in or ruling-out carpal tunnel syndrome:

- Sex/gender
- Ethnicity
- Bilateral symptoms
- Diabetes mellitus
- Worsening symptoms at night
- Duration of symptoms
- Patient localization of symptoms
- Hand dominance
- Symptomatic limb
- Age
- BMI

Strength of Recommendation: Moderate Evidence ★★★☆

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

PATIENT REPORTED NUMBNESS OR PAIN

Limited evidence supports that patients who do not report frequent numbness or pain might not have carpal tunnel syndrome.

Strength of Recommendation: Limited Evidence ★★★☆

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

HAND-HELD NERVE CONDUCTION STUDY (NCS)

Limited evidence supports that a hand-held nerve conduction study (NCS) device might be used for the diagnosis of carpal tunnel syndrome.

Strength of Recommendation: Limited Evidence ★★★☆

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.
MRI
Moderate evidence supports not routinely using MRI for the diagnosis of carpal tunnel syndrome.

Strength of Recommendation: Moderate Evidence ★★★★☆

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

DIAGNOSTIC ULTRASOUND
Limited evidence supports not routinely using ultrasound for the diagnosis of carpal tunnel syndrome.

Strength of Recommendation: Limited Evidence ★★★★☆

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

DIAGNOSTIC SCALES
Moderate evidence supports that diagnostic questionnaires and/or electrodiagnostic studies could be used to aid the diagnosis of carpal tunnel syndrome.

Strength of Recommendation: Moderate Evidence ★★★★☆

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

INCREASED RISK OF CTS
A. Strong evidence supports that BMI and high hand/wrist repetition rate are associated with the increased risk of developing carpal tunnel syndrome (CTS).

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.
B. Moderate evidence supports that the following factors are associated with the increased risk of developing carpal tunnel syndrome (CTS):

a. Peri-menopausal
b. Wrist Ratio/Index
c. Rheumatoid Arthritis
d. Psychosocial factors
e. Distal upper extremity tendinopathies
f. Gardening
g. ACGIH Hand Activity Level at or above threshold
h. Assembly line work
i. Computer work
j. Vibration
k. Tendonitis
l. Workplace forceful grip/exertion

Strength of Recommendation: Moderate Evidence

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

C. Limited evidence supports that the following factors are associated with the increased risk of developing carpal tunnel syndrome (CTS):

a. Dialysis
b. Fibromyalgia
c. Varicosis
d. Distal radius fracture

Strength of Recommendation: Limited Evidence

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

DECREASED RISK OF CTS

Moderate evidence supports that physical activity/exercise is associated with the decreased risk of developing carpal tunnel syndrome (CTS).

Strength of Recommendation: Moderate Evidence

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.
FACTORS SHOWING NO ASSOCIATED RISK OF CTS

A. Moderate evidence supports that the use of oral contraception and female hormone replacement therapy (HRT) are not associated with increased or decreased risk of developing carpal tunnel syndrome (CTS).

Strength of Recommendation: Moderate Evidence ⭐⭐⭐
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

B. Limited evidence supports that race/ethnicity and female education level are not associated with increased or decreased risk of developing carpal tunnel syndrome (CTS).

Strength of Recommendation: Limited Evidence ⭐⭐⭐
Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

FACTORS SHOWING CONFLICTING RISK OF CTS

Limited evidence supports that the following factors have conflicting results regarding the development of carpal tunnel syndrome (CTS):

- Diabetes
- Age
- Gender/Sex
- Genetics
- Comorbid drug use
- Smoking
- Wrist bending
- Workplace

Strength of Recommendation: Limited Evidence ⭐⭐⭐
Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

IMMOBILIZATION

Strong evidence supports that the use of immobilization (brace/splint/orthosis) should improve patient reported outcomes.

Strength of Recommendation: Strong Evidence ⭐⭐⭐⭐
Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.
STEROID INJECTIONS
Strong evidence supports that the use of steroid (methylprednisolone) injection should improve patient reported outcomes.

Strength of Recommendation: Strong Evidence ★★★★★
Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

MAGNET THERAPY
Strong evidence supports not using magnet therapy for the treatment of carpal tunnel syndrome.

Strength of Recommendation: Strong Evidence ★★★★★
Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.

ORAL TREATMENTS
Moderate evidence supports no benefit of oral treatments (diuretic, gabapentin, astaxanthin capsules, NSAIDs, or pyridoxine) compared to placebo.

Strength of Recommendation: Moderate Evidence ★★★★☆
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

ORAL STEROIDS
Moderate evidence supports that oral steroids could improve patient reported outcomes as compared to placebo.

Strength of Recommendation: Moderate Evidence ★★★★☆
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

KETOPROFEN PHONOPHORESIS
Moderate evidence supports that ketoprofen phonophoresis could provide reduction in pain compared to placebo.

Strength of Recommendation: Moderate Evidence ★★★★☆
Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.
**THERAPEUTIC ULTRASOUND**

Limited evidence supports that therapeutic ultrasound might be effective compared to placebo.

*Strength of Recommendation: Limited Evidence ★★★★

*Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.*

**LASER THERAPY**

Limited evidence supports that laser therapy might be effective compared to placebo.

*Strength of Recommendation: Limited Evidence ★★★★

*Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.*

**SURGICAL RELEASE LOCATION**

Strong evidence supports that surgical release of the transverse carpal ligament should relieve symptoms and improve function.

*Strength of Recommendation: Strong Evidence ★★★★★

*Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.*

**SURGICAL RELEASE PROCEDURE**

Limited evidence supports that if surgery is chosen, a practitioner might consider using endoscopic carpal tunnel release based on possible short term benefits. Strength of Recommendation: Limited Evidence ★★★★

*Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.*

**SURGICAL VERSUS NONOPERATIVE**

Strong evidence supports that surgical treatment of carpal tunnel syndrome should have a greater treatment benefit at 6 and 12 months as compared to splinting, NSAIDs/therapy, and a single steroid injection.

*Strength of Recommendation: Strong Evidence ★★★★★

*Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.*
ADJUNCTIVE TECHNIQUES

Moderate evidence supports that there is no benefit to routine inclusion of the following adjunctive techniques: epineurotomy, neurolysis, flexor tenosynovectomy, and lengthening/reconstruction of the flexor retinaculum (transverse carpal ligament).

Strength of Recommendation: Moderate Evidence

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

BILATERAL VERSUS STAGED CARPAL TUNNEL RELEASE

Limited evidence supports that simultaneous bilateral or staged endoscopic carpal tunnel release might be performed based on patient and surgeon preference. No evidence meeting the inclusion criteria was found addressing bilateral simultaneous open carpal tunnel release.

Strength of Recommendation: Limited Evidence

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

LOCAL VERSUS IV REGIONAL ANESTHESIA

Limited evidence supports the use of local anesthesia rather than intravenous regional anesthesia (bier block) because it might offer longer pain relief after carpal tunnel release; no evidence meeting our inclusion criteria was found comparing general anesthesia to either regional or local anesthesia for carpal tunnel surgery.

Strength of Recommendation: Limited Evidence

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

BUFFERED VERSUS PLAIN LIDOCAINE

Moderate evidence supports the use of buffered lidocaine rather than plain lidocaine for local anesthesia because it could result in less injection pain.

Strength of Recommendation: Moderate Evidence

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.
ASPIRIN USE
Limited evidence supports that the patient might continue the use of aspirin perioperatively; no evidence meeting our inclusion criteria addressed other anticoagulants.
Strength of Recommendation: Limited Evidence ★★★ ★

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

PREOPERATIVE ANTIBIOTICS
Limited evidence supports that there is no benefit for routine use of prophylactic antibiotics prior to carpal tunnel release because there is no demonstrated reduction in postoperative surgical site infection.
Strength of Recommendation: Limited Evidence ★★★ ★

Description: Evidence from two or more “Low” strength studies with consistent findings or evidence from a single study for recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

SUPERVISED VERSUS HOME THERAPY
Moderate evidence supports no additional benefit to routine supervised therapy over home programs in the immediate postoperative period. No evidence meeting the inclusion criteria was found comparing the potential benefit of exercise versus no exercise after surgery.
Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” strength studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

POSTOPERATIVE IMMOBILIZATION
Strong evidence supports no benefit to routine postoperative immobilization after carpal tunnel release.
Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” strength studies with consistent findings for recommending for or against the intervention.
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III. INTRODUCTION

Overview
This clinical practice guideline is based on a systematic review of published studies with regard to the diagnosis and treatment of carpal tunnel syndrome (CTS). In addition to providing practice recommendations, this guideline also highlights limitations in the literature and areas that require future research.

This guideline is intended to be used by all qualified and appropriately trained physicians and surgeons involved in the diagnosis and treatment of CTS. It is also intended to serve as an information resource for decision makers and developers of practice guidelines and recommendations.

The following definition of carpal tunnel syndrome has been added to the introduction section: “For the purpose of this guideline, Carpal Tunnel Syndrome (CTS) is defined as follows: Carpal Tunnel Syndrome is a symptomatic compression neuropathy of the median nerve at the level of the wrist, characterized physiologically by evidence of increased pressure within the carpal tunnel and decreased function of the nerve at that level. Carpal Tunnel Syndrome can be caused by many different diseases, conditions and events. It is characterized by patients as producing numbness, tingling, hand and arm pain and muscle dysfunction. The disorder is not restricted by age, gender, ethnicity, or occupation and is associated with or caused by systemic disease and local mechanical and disease factors.

Goals and Rationale
The purpose of this clinical practice guideline is to help improve treatment based on the current best evidence. Current evidence-based medicine (EBM) standards demand that physicians use the best available evidence in their clinical decision making. To assist them, this clinical practice guideline consists of a systematic review of the available literature regarding the diagnosis and treatment of CTS. The systematic review detailed herein was conducted between February 2013 and February 2015 and demonstrates where there is good evidence, where evidence is lacking, and what topics future research must target in order to improve the diagnosis and treatment of CTS. AAOS staff and the physician work group systematically reviewed the available literature and subsequently wrote the following recommendations based on a rigorous, standardized process.

Musculoskeletal care is provided in many different settings by many different providers. We created this guideline as an educational tool to guide qualified physicians through a series of treatment decisions in an effort to improve the quality and efficiency of care. This guideline should not be construed as including all proper methods of care or excluding methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding any specific procedure or treatment must be made in light of all circumstances presented by the patient and the needs and resources particular to the locality or institution.

Intended Users
This guideline is intended to be used by orthopaedic surgeons and physicians managing carpal tunnel syndrome. Typically, orthopaedic surgeons will have completed medical training, a qualified residency in orthopaedic surgery, and some may have completed additional sub-
specialty training. General surgeons, plastic surgeons, neurosurgeons, primary care physicians, hospital-based and outpatient adult internal medicine specialists, including neurologists, physiatrists and occupational health medicine specialists, physical therapists, occupational therapists, nurse practitioners, physician assistants, and other healthcare professionals who routinely see this type of patient in various practice settings may also benefit from this guideline.

This guideline is not intended for use as a benefits determination document.

The care of CTS is based on the assumption that decisions are predicated on the patient and / or the patient’s qualified health care advocate having physician communication with discussion of available treatments and procedures applicable to the individual patient. Once the patient and or their advocate have been informed of available therapies and have discussed these options with his/her physician, an informed decision can be made. Clinician input based on experience with conservative management and the clinician’s surgical experience and skills increases the probability of identifying patients who will benefit from specific treatment options.

**Patient Population**
This document addresses the diagnosis and treatment of adult patients presenting with complaints which may be attributable to CTS.

**Burden of Disease**
CTS is the most common compressive neuropathy affecting the upper extremity and is an important cause of lost workplace productivity. The prevalence of CTS is estimated to be 0.7/10,000 workers. Between 1997 and 2010 CTS was the second most common cause of days lost from the workplace. Throughout this period the median time lost per case of CTS varied between 21 and 32 days.

**Etiology**
CTS is caused by compression of the median nerve under the transverse carpal ligament. Although pressure on the median nerve is clearly the pathophysiologic basis for the symptoms observed clinically, the etiology of elevated pressure within the carpal canal is unknown.

**Risk Factors**
Conditions which occupy volume within the carpal canal may increase the risk of symptomatic compression of the median nerve. Diseases affecting the synovium of the flexor tendons, such as rheumatoid arthritis, or rare tumors or anomalously muscles in the carpal canal are example of uncommonly encountered medical conditions associated with an increased risk of CTS. Given that the cause of increased pressure within the carpal canal is unknown in the majority of cases, there is little known about risk factors for developing CTS, although a number of associations both with medical conditions and workplace exposures have been described. For more information regarding risk factors, please see the recommendations concerning risk factors for CTS.
Emotional and Physical Impact
The principal impact of CTS on patients relates to the sensory disturbance which may disrupt sleep and, during non-sleeping hours, impair strength and the ability to carry out fine manipulation. CTS may also be associated with pain in the wrist and digits. These symptoms may have a substantial effect on an individual’s ability to accomplish activities of daily living and to perform work-related duties.

Potential Benefits, Harms, and Contraindications
The main benefit of a guideline focused on diagnosis is the emphasis on standardized diagnostic criteria which reduce variability in the case definition for CTS. This could have an important impact on the care of CTS, by minimizing the risk of incorrect diagnosis, and also help in the design of studies seeking to identify associations with specific workplace exposures, an area of interest for workers.

Future Research
A significant obstacle to evaluating pathways to the treatment of CTS is the absence of a widely accepted reference standard for the diagnosis. An effort to achieve consensus among the many clinical disciplines which evaluate and treat CTS is an important goal of future research in this area. If consensus of this nature can be established, then a clear and consistent case definition should allow a comparison of treatment options as well as an evaluation of the impact of workplace exposures on the development of CTS symptoms.
IV. METHODS

The methods used to perform this systematic review were employed to minimize bias and enhance transparency in the selection, appraisal, and analysis of the available evidence. These processes are vital to the development of reliable, transparent, and accurate clinical recommendations for treating carpal tunnel syndrome.

This clinical practice guideline and the systematic review upon which it is based evaluate the effectiveness of treatments for carpal tunnel syndrome. This section describes the methods used to prepare this guideline and systematic review, including search strategies used to identify literature, criteria for selecting eligible articles, determining the strength of the evidence, data extraction, methods of statistical analysis, and the review and approval of the guideline. The AAOS approach incorporates practicing physicians (clinical experts) and methodologists who are free of potential conflicts of interest as recommended by guideline development experts.\textsuperscript{10}

The AAOS understands that only high-quality guidelines are credible, and we go to great lengths to ensure the integrity of our evidence analyses. The AAOS addresses bias beginning with the selection of guideline development group members. Applicants with financial conflicts of interest (COI) related to the guideline topic cannot participate if the conflict occurred within one year of the start date of the guideline’s development or if an immediate family member has, or has had, a relevant financial conflict. Additionally, all guideline development group members sign an attestation form agreeing to remain free of relevant financial conflicts for two years following the publication of the guideline.

This guideline and systematic review were prepared by the AAOS Management of Carpal Tunnel Syndrome Guideline physician guideline development group (clinical experts) with the assistance of the AAOS Evidence-Based Medicine (EBM) Unit in the Department of Research and Scientific Affairs (methodologists) at the AAOS. To develop this guideline, the guideline development group held an introductory meeting on February 1, 2013 to establish the scope of the guideline and the systematic reviews. As the physician experts, the guideline development group defined the scope of the guideline by creating PICO Questions (i.e. population, intervention, comparison, and outcome) that directed the literature search. When necessary, these clinical experts also provided content help, search terms and additional clarification for the AAOS Medical Librarian. The Medical Librarian created and executed the search(s). The supporting group of methodologists (AAOS EBM Unit) reviewed all abstracts, recalled pertinent full-text articles for review and evaluated the quality of studies meeting the inclusion criteria. They also abstracted, analyzed, interpreted, and/or summarized the relevant evidence for each recommendation and prepared the initial draft for the final meeting. Upon completion of the systematic reviews, the physician guideline development group participated in a three-day recommendation meeting on May 15-17, 2015. At this meeting, the physician experts and methodologists evaluated and integrated all material to develop the final recommendations. The final recommendations and rationales were edited, written and voted on at the final meeting. The draft guideline recommendations and rationales received final review by the methodologists to ensure that these recommendations and rationales were consistent with the data. The draft was then completed and submitted for peer review on September 8\textsuperscript{th}, 2015.
The resulting draft guidelines were then peer-reviewed, edited in response to that review and subsequently sent for public commentary, where after additional edits were made. Thereafter, the draft guideline was sequentially approved by the AAOS Committee on Evidence-Based Quality and Value, AAOS Council on Research and Quality, and the AAOS Board of Directors (see Appendix II for a description of the AAOS bodies involved in the approval process). All AAOS guidelines are reviewed and updated or retired every five years in accordance with the criteria of the National Guideline Clearinghouse.

Thus the process of AAOS guideline development incorporates the benefits from clinical physician expertise as well as the statistical knowledge and interpretation of non-conflicted methodologists. The process also includes an extensive review process offering the opportunity for over 200 clinical physician experts to provide input into the draft prior to publication. This process provides a sound basis for minimizing bias, enhancing transparency and ensuring the highest level of accuracy for interpretation of the evidence.

**FORMULATING PICO QUESTIONS**

The guideline development group began work on this guideline by constructing a set of PICO questions. These questions specify the patient population of interest (P), the intervention of interest (I), the comparisons of interest (C), and the patient-oriented outcomes of interest (O). They function as questions for the systematic review, not as final recommendations or conclusions. Once established, these a priori PICO questions cannot be modified until the final guideline development group meeting.

**STUDY SELECTION CRITERIA**

We developed a priori article inclusion criteria for our review. These criteria are our “rules of evidence” and articles that did not meet them are, for the purposes of this guideline, not evidence.

To be included in our systematic reviews (and hence, in this guideline) an article had to meet the following criteria:

- Study must be of an CTS injury or prevention thereof
- Study must be published in or after 1966 for surgical treatment, rehabilitation, bracing, prevention and MRI
- Study must be published in or after 1966 for x rays and non-operative treatment
- Study must be published in or after 1966 for all others non specified
- Study should have 10 or more patients per group
- For surgical treatment a minimum of 3 months follow up duration.
- Antibiotic prophylaxis, anticoagulations, mode of anesthesia: all follow-ups
- For non-operative treatment a minimum of 1 month.

**Standard Criteria for all CPGs**

Article must be a full article report of a clinical study. Retrospective non-comparative case series, medical records review, meeting abstracts, historical articles, editorials, letters, and commentaries are excluded. Confounded studies (i.e. studies that give patients the treatment of interest AND another treatment) are excluded.
Case series studies that have non-consecutive enrollment of patients are excluded.
Controlled trials in which patients were not stochastically assigned to groups AND in which there was either a difference in patient characteristics or outcomes at baseline AND where the authors did not statistically adjust for these differences when analyzing the results are excluded.
All studies of “Very Weak” strength of evidence are excluded.
All studies evaluated as Level V will be excluded.
Composite measures or outcomes are excluded even if they are patient-oriented.
Study must appear in a peer-reviewed publication
For any included study that uses “paper-and-pencil” outcome measures (e.g., SF-36), only those outcome measures that have been validated will be included
For any given follow-up time point in any included study, there must be ≥ 50% patient follow-up (if the follow-up is >50% but <80%, the study quality will be downgraded by one Level)
Study must be of humans
Study must be published in English
Study results must be quantitatively presented
Study must not be an in vitro study
Study must not be a biomechanical study
Study must not have been performed on cadavers

We will only evaluate surrogate outcomes when no patient oriented outcomes are available.

BEST EVIDENCE SYNTHESIS
We included only the best available evidence for any given outcome addressing a recommendation. Accordingly, we first included the highest quality evidence for any given outcome if it was available. In the absence of two or more occurrences of an outcome at this quality, we considered outcomes of the next lowest quality until at least two or more occurrences of an outcome had been acquired. For example, if there were two ‘moderate’ quality occurrences of an outcome that addressed a recommendation, we did not include ‘low’ quality occurrences of this outcome. A summary of the evidence that met the inclusion criteria, but was not best available evidence was created and can be viewed by recommendation in Appendix XIII.

MINIMALLY CLINICALLY IMPORTANT IMPROVEMENT
Wherever possible, we consider the effects of treatments in terms of the minimally clinically important difference (MCID) in addition to whether their effects are statistically significant. The MCID is the smallest clinical change that is important to patients, and recognizes the fact that there are some treatment-induced statistically significant improvements that are too small to matter to patients. However, there were no occurrences of validated MCID outcomes in the studies included in this clinical practice guideline.

When MCID values from the specific guideline patient population are not available, we use the following measures listed in order of priority:

1) MCID/MID
2) PASS or Impact
3) Another validated measure
4) Statistical Significance
LITERATURE SEARCHES
We begin the systematic review with a comprehensive search of the literature. Articles we consider were published prior to February 27, 2015 in four electronic databases; PubMed, EMBASE, CINAHL, and The Cochrane Central Register of Controlled Trials. The medical librarian conducts the search using key terms determined from the guideline development group’s preliminary recommendations.

We supplement the electronic search with a manual search of the bibliographies of all retrieved publications, recent systematic reviews, and other review articles for potentially relevant citations. Recalled articles are evaluated for possible inclusion based on the study selection criteria and are summarized for the guideline development group who assist with reconciling possible errors and omissions.

The study attrition diagram in Appendix IV provides a detailed description of the numbers of identified abstracts and recalled and selected studies that were evaluated in the systematic review of this guideline. The search strategies used to identify the abstracts are contained in Appendix V.

METHODS FOR EVALUATING EVIDENCE
As noted earlier, we judge quality based on a priori PICO questions and use an automated numerical scoring process to arrive at final ratings. Extensive measures are taken to determine quality ratings so that they are free of bias.

We evaluate the quality of evidence separately for each study using modified versions of the GRADE and QUADAS instruments. Depending on the type of study (i.e. diagnostic, prognostic, randomized control trial, or observational) the study design is evaluated using a list of standardized questions (see below for the domains evaluated for each type of study design).

DIAGNOSTIC STUDY QUALITY APPRAISAL QUESTIONS
The following questions are used to evaluate the study quality of diagnostic study designs.

1. Was the patient spectrum representative of the patients who will receive the test in practice?
2. Were the selection criteria clearly described?
3. Was the execution of the index and reference tests described in sufficient detail to permit its replication?
4. Is the reference standard likely to correctly classify the target condition?
5. Are the index test(s) results interpreted by an examiner without the knowledge of the reference tests results (or vice versa)?
6. Other Bias?

Diagnostic Study Design Quality Key

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**PROGNOSTIC STUDY QUALITY APPRAISAL QUESTIONS**

The following questions are used to evaluate the study quality of prognostic study designs.

1. Was the spectrum of patients studied for this prognostic variable representative of the patient spectrum seen in actual clinical practice?
2. Was loss to follow up unrelated to key characteristics?
3. Was the prognostic factor of interest adequately measured in the study to limit potential bias?
4. Was the outcome of interest adequately measured in study participants to sufficiently limit bias?
5. Were all important confounders adequately measured in study participants to sufficiently limit potential bias?
6. Was the statistical analysis appropriate for the design of the study, limiting potential for presentation of invalid results?

**Prognostic Study Design Quality Key**

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<td>≥3 Flaws</td>
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**RANDOMIZED STUDY QUALITY APPRAISAL QUESTIONS**

The following domains are evaluated to determine the study quality of randomized study designs.

1. Random Sequence Generation
2. Allocation Concealment
3. Blinding of Participants and Personnel
4. Incomplete Outcome Data
5. Selective Reporting
6. Other Bias

**Upgrading Randomized Study Quality Questions**

1. Is there a large magnitude of effect?
2. Influence of All Plausible Residual Confounding
3. Dose-Response Gradient
**Randomized Study Design Quality Key**

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**OBSERVATIONAL STUDY DESIGN QUALITY APPRAISAL QUESTIONS**

The following questions are used to evaluate the study quality of observational study designs. Note that all observation studies begin the appraisal process at “low quality” due to design flaws inherent in observational studies.

1. Is this observational study a prospective case series?
2. Does the strategy for recruiting participants into the study differ across groups?
3. Did the study fail to balance the allocation between the groups or match groups (e.g., through stratification, matching, propensity scores)?
4. Were important confounding variables not taken into account in the design and/or analysis (e.g., through matching, stratification, interaction terms, multivariate analysis, or other statistical adjustment such as instrumental variables)?
5. Was the length of follow-up different across study groups?
6. Other Bias?

**Upgrading Observational Study Quality Questions**

1. Is there a large magnitude of effect?
2. Influence of All Plausible Residual Confounding
3. Dose-Response Gradient

**Observational Study Design Quality Key**

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<th>High Quality Study</th>
<th>&lt;2 Flaw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate Quality Study</td>
<td>≥2 and &lt;4 Flaws</td>
</tr>
<tr>
<td>Low Quality Study</td>
<td>≥4 and &lt;6 Flaws</td>
</tr>
<tr>
<td>Very Low Quality Study</td>
<td>≥6 Flaws</td>
</tr>
</tbody>
</table>

**DEFINING THE STRENGTH OF THE RECOMMENDATIONS**

Judging the strength of evidence is only a stepping stone towards arriving at the strength of a guideline recommendation. The strength of recommendation also takes into account the quality, quantity, and the trade-off between the benefits and harms of a treatment, the magnitude of a treatment’s effect, and whether there is data on critical outcomes.

Strength of recommendation expresses the degree of confidence one can have in a recommendation. As such, the strength expresses how possible it is that a recommendation will be overturned by future evidence. It is very difficult for future evidence to overturn a recommendation that is based on many high quality randomized controlled trials that show a
large effect. It is much more likely that future evidence will overturn recommendations derived from a few small case series. Consequently, recommendations based on the former kind of evidence are given a high strength of recommendation and recommendations based on the latter kind of evidence are given a low strength.

To develop the strength of a recommendation, AAOS staff first assigned a preliminary strength for each recommendation that took only the final strength of evidence (including quality and applicability) and the quantity of evidence (see Table 1).

**Table 1. Strength of Recommendation Descriptions**

<table>
<thead>
<tr>
<th>Strength</th>
<th>Overall Strength of Evidence</th>
<th>Description of Evidence Quality</th>
<th>Strength Visual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Strong</td>
<td>Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.</td>
<td>![5 stars]</td>
</tr>
<tr>
<td>Moderate</td>
<td>Moderate</td>
<td>Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.</td>
<td>![4 stars 1 star]</td>
</tr>
<tr>
<td>Limited</td>
<td>Low Strength Evidence or Conflicting Evidence</td>
<td>Evidence from two or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for against the intervention or diagnostic or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.</td>
<td>![3 stars 2 stars]</td>
</tr>
<tr>
<td>Consensus</td>
<td>No Evidence</td>
<td>There is no supporting evidence. In the absence of reliable evidence, the guideline development group is making a recommendation based on their clinical opinion. Consensus statements are published in a separate, complimentary document.</td>
<td>![5 stars]</td>
</tr>
</tbody>
</table>

**WORDING OF THE FINAL RECOMMENDATIONS**

To prevent bias in the way recommendations are worded, the AAOS uses specific predetermined language stems that are governed by the evidence strengths. Each recommendation was written using language that accounts for the final strength of the recommendation. This language, and the corresponding strength, is shown in Table 2.
Table 2. AAOS Guideline Language Stems

<table>
<thead>
<tr>
<th>Guideline Language</th>
<th>Strength of Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong evidence supports that the practitioner should/should not do X, because…</td>
<td>Strong</td>
</tr>
<tr>
<td>Moderate evidence supports that the practitioner could/could not do X, because…</td>
<td>Moderate</td>
</tr>
<tr>
<td>Limited evidence supports that the practitioner might/might not do X, because…</td>
<td>Limited</td>
</tr>
<tr>
<td>In the absence of reliable evidence, it is the opinion of this guideline development group that...*</td>
<td>Consensus*</td>
</tr>
</tbody>
</table>

*Consensus based recommendations are made according to specific criteria. These criteria can be found in Appendix VII.

APPLYING THE RECOMMENDATIONS TO CLINICAL PRACTICE

To increase the practicality and applicability of the guideline recommendations in this document, the information listed in Table 3 provides assistance in interpreting the correlation between the strength of a recommendation and patient counseling time, use of decision aids, and the impact of future research.

Table 3. Clinical Applicability: Interpreting the Strength of a Recommendation

<table>
<thead>
<tr>
<th>Strength of Recommendation</th>
<th>Patient Counseling (Time)</th>
<th>Decision Aids</th>
<th>Impact of Future Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>Least</td>
<td>Least Important, unless the evidence supports no difference between two alternative interventions</td>
<td>Not likely to change</td>
</tr>
<tr>
<td>Moderate</td>
<td>Less</td>
<td>Less Important</td>
<td>Less likely to change</td>
</tr>
<tr>
<td>Limited</td>
<td>More</td>
<td>Important</td>
<td>Change possible/anticipated</td>
</tr>
<tr>
<td>Consensus</td>
<td>Most</td>
<td>Most Important</td>
<td>Impact unknown</td>
</tr>
</tbody>
</table>

VOTING ON THE RECOMMENDATIONS

The recommendations and their strength were voted on by the guideline development group members during the final meeting. If disagreement between the guideline development group occurred, there was further discussion to see whether the disagreement(s) could be resolved. Recommendations were approved and adopted in instances where a simple majority (60%) of the guideline development group voted to approve.
STATISTICAL METHODS

ANALYSIS OF DIAGNOSTIC DATA
Likelihood ratios, sensitivity, specificity and 95% confidence intervals were calculated to determine the accuracy of diagnostic modalities based on two by two diagnostic contingency tables extracted from the included studies. When summary values of sensitivity, specificity, or other diagnostic performance measures were reported, estimates of the diagnostic contingency table were used to calculate likelihood ratios.

Likelihood ratios (LR) indicate the magnitude of the change in probability of disease due to a given test result. For example, a positive likelihood ratio of 10 indicates that a positive test result is 10 times more common in patients with disease than in patients without disease. Likelihood ratios are interpreted according to previously published values, as seen in Table 4 below.

![Table 4. Interpreting Likelihood Ratios](image)

<table>
<thead>
<tr>
<th>Positive Likelihood Ratio</th>
<th>Negative Likelihood Ratio</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10</td>
<td>&lt;0.1</td>
<td>Large and conclusive change in probability</td>
</tr>
<tr>
<td>5-10</td>
<td>0.1-0.2</td>
<td>Moderate change in probability</td>
</tr>
<tr>
<td>2-5</td>
<td>0.2-0.5</td>
<td>Small (but sometimes important change in probability)</td>
</tr>
<tr>
<td>1-2</td>
<td>0.5-1</td>
<td>Small (and rarely important) change in probability</td>
</tr>
</tbody>
</table>

ANALYSIS OF INTERVENTION/PREVENTION DATA
When possible, we recalculate the results reported in individual studies and compile them to answer the recommendations. The results of all statistical analysis conducted by the AAOS Clinical Practice Guidelines Unit are conducted using SAS 9.4. SAS was used to determine the magnitude, direction, and/or 95% confidence intervals of the treatment effect. For data reported as means (and associated measures of dispersion) the mean difference between groups and the 95% confidence interval was calculated and a two-tailed t-test of independent groups was used to determine statistical significance. When published studies report measures of dispersion other than the standard deviation the value was estimated to facilitate calculation of the treatment effect. In studies that report standard errors or confidence intervals the standard deviation was back-calculated. In some circumstances statistical testing was conducted by the authors and measures of dispersion were not reported. In the absence of measures of dispersion, the results of the statistical analyses conducted by the authors (i.e. the p-value) are considered as evidence. For proportions, we report the proportion of patients that experienced an outcome along with the percentage of patients that experienced an outcome. The variance of the arcsine difference was used to determine statistical significance. P-values < 0.05 were considered statistically significant.

When the data was available, we performed meta-analyses using the random effects method of DerSimonian and Laird. A minimum of three studies was required for an outcome to be considered by meta-analysis. Heterogeneity was assessed with the I-squared statistic. Meta-analyses with I-squared values less than 50% were considered as evidence. Those with I-squared
larger than 50% were not considered as evidence for this guideline. All meta-analyses were performed using SAS 9.4. The arcsine difference was used in meta-analysis of proportions. In order to overcome the difficulty of interpreting the magnitude of the arcsine difference, a summary odds ratio is calculated based on random effects meta-analysis of proportions and the number needed to treat (or harm) is calculated. The standardized mean difference was used for meta-analysis of means and magnitude was interpreted using Cohen’s definitions of small, medium, and large effect.

PEER REVIEW
Following the final meeting, the guideline draft undergoes peer review for additional input from external content experts. Written comments are provided on the structured review form (see Appendix VII). All peer reviewers are required to disclose their conflicts of interest. To guide who participates, the guideline development group identifies specialty societies at the introductory meeting. Organizations, not individuals, are specified.

The specialty societies are solicited for nominations of individual peer reviewers approximately six weeks before the final meeting. The peer review period is announced as it approaches and others interested are able to volunteer to review the draft. The chair of the AAOS committee on Evidence Based Quality and Value reviews the draft of the guideline prior to dissemination.

Some specialty societies (both orthopaedic and non-orthopaedic) ask their evidence-based practice (EBP) committee to provide review of the guideline. The organization is responsible for coordinating the distribution of our materials and consolidating their comments onto one form. The chair of the external EBP committees provides disclosure of their conflicts of interest (COI) and manages the potential conflicts of their members.

Again, the AAOS asks for comments to be assembled into a single response form by the specialty society and for the individual submitting the review to provide disclosure of potentially conflicting interests. The peer review stage gives external stakeholders an opportunity to provide evidence-based direction for modifications that they believe have been overlooked. Since the draft is subject to revisions until its approval by the AAOS Board of Directors as the final step in the guideline development process, confidentiality of all working drafts is essential.

The manager of the evidence-based medicine unit drafts the initial responses to comments that address methodology. These responses are then reviewed by the guideline development group chair and vice-chair, who respond to questions concerning clinical practice and techniques. The director of the Department of Research and Scientific Affairs provides input as well. All comments received and the initial drafts of the responses are also reviewed by all members of the guideline development group. All changes to a recommendation as a result of peer review are based on the evidence and undergoes majority vote by the guideline development group members via teleconference. Final revisions are summarized in a detailed report that is made part of the guideline document throughout the remainder of the review and approval processes.

The AAOS believes in the importance of demonstrating responsiveness to input received during the peer review process and welcomes the critiques of external specialty societies. Following final approval of the guideline, all individual responses are posted on our website.
http://www.aaos.org/guidelines with a point-by-point reply to each non-editorial comment. Reviewers who wish to remain anonymous notify the AAOS to have their names de-identified; their comments, our responses, and their COI disclosures are still posted.

Review of the Management of Carpal tunnel syndrome guideline was requested of 18 organizations. Seven returned comments on the structured review form (see Appendix IX).

PUBLIC COMMENTARY
After modifying the draft in response to peer review, the guideline was subjected to a thirty day period of “Public Commentary.” Commentators consist of members of the AAOS Board of Directors (BOD), members of the Council on Research and Quality (CORQ), members of the Board of Councilors (BOC), and members of the Board of Specialty Societies (BOS). The guideline is automatically forwarded to the AAOS BOD and CORQ so that they may review it and provide comment prior to being asked to approve the document. Members of the BOC and BOS are solicited for interest. If they request to see the document, it is forwarded to them for comment. Based on these bodies, over 200 commentators have the opportunity to provide input into this guideline. Three members returned public comments.

THE AAOS GUIDELINE APPROVAL PROCESS
This final guideline draft must be approved by the AAOS Committee on Evidence Based Quality and Value Committee, the AAOS Council on Research and Quality, and the AAOS Board of Directors. These decision-making bodies are described in Appendix II and are not designated to modify the contents. Their charge is to approve or reject its publication by majority vote.

REVISION PLANS
This guideline represents a cross-sectional view of current treatment and may become outdated as new evidence becomes available. This guideline will be revised in accordance with new evidence, changing practice, rapidly emerging treatment options, and new technology. This guideline will be updated or withdrawn in five years in accordance with the standards of the National Guideline Clearinghouse.

GUIDELINE DISSEMINATION PLANS
The primary purpose of the present document is to provide interested readers with full documentation about not only our recommendations, but also about how we arrived at those recommendations.
To view all AAOS published guideline recommendations in a user-friendly app, please visit www.orthoguidelines.org.

Shorter versions of the guideline are available in other venues. Publication of most guidelines is announced by an Academy press release, articles authored by the guideline development group and published in the Journal of the American Academy of Orthopaedic Surgeons, and articles published in AAOS Now. Most guidelines are also distributed at the AAOS Annual Meeting in various venues such as on Academy Row and at Committee Scientific Exhibits.

Selected guidelines are disseminated by webinar, an Online Module for the Orthopaedic Knowledge Online website, Radio Media Tours, Media Briefings, and by distributing them at relevant Continuing Medical Education (CME) courses and at the AAOS Resource Center.

Other dissemination efforts outside of the AAOS will include submitting the guideline to the National Guideline Clearinghouse and distributing the guideline at other medical specialty societies’ meetings.
V. Overview of Articles by Recommendation*

*Note, some articles were applicable to multiple recommendations
VI. FULL GUIDELINE RECOMMENDATIONS

PHYSICAL EXAM GUIDELINE RECOMMENDATIONS

A. OBSERVATION
Strong evidence supports Thenar atrophy is strongly associated with ruling-in carpal tunnel syndrome, but poorly associated with ruling-out carpal tunnel syndrome.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.

There were two high quality (Claes, 2013; Naranjo, 2007) and two moderate quality studies (Gomes, 2006; Makanji, 2014) with strong evidence that the presence of thenar atrophy can rule in the diagnosis of CTS. Pooling the results into a meta-analysis demonstrated a strong association with electrodiagnostic studies (EDS) that used the criteria for the diagnosis of CTS established by the American Association of Electrodiagnostic Medicine (AANEM). The individual studies, as well as the meta-analysis, showed that the absence of thenar atrophy did not rule out the diagnosis of CTS. The meta-analysis did not include two moderate quality studies (De Krom, 1990 or Gerr, 1998) because of variations in the electrodiagnostic test methods and also because of the availability of higher quality evidence examining the utility of thenar atrophy. The study by Claes was somewhat limited by its exclusion of the patients with severe thenar atrophy. The studies also did not clearly differentiate loss of thenar muscle bulk on a neurogenic basis versus disuse atrophy, for example in cases of trapeziometacarpal joint osteoarthritis.

B. PHYSICAL SIGNS
Strong evidence supports not using the Phalen Test, Tinel Sign, Flick Sign, or Upper limb neurodynamic/nerve tension test (ULNT) criterion A/B as independent physical examination maneuvers to diagnose carpal tunnel syndrome, because alone, each has a poor or weak association with ruling-in or ruling-out carpal tunnel syndrome.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.

Rationale
Evidence from five high quality studies (Gok, 2008; Naranjo, 2007; Vanti, 2011; Vanti, 2012; Wainner, 2005) and one moderate quality study (Tan, 2012) supports not using the Phalen Test, Tinel Sign, Flick Sign, or ULNT criterion A/B as independent physical examination maneuvers
to rule in or rule out the diagnosis of carpal tunnel syndrome. Each of these studies showed poor agreement with electrodiagnostic tests as the reference standard. The EDS criteria in some instances used the AANEM criteria and in others general EDS methods. A meta-analysis of the performance of the Tinel sign and Phalen test also demonstrated poor agreement to this reference standard.

C. MANEUVERS
Moderate evidence supports not using the following as independent physical examination maneuvers to diagnose carpal tunnel syndrome, because alone, each has a poor or weak association with ruling-in or ruling-out carpal tunnel syndrome:

- Carpal Compression test
- Reverse Phalen Test
- Thenar Weakness or Thumb Abduction Weakness or Abductor Pollicis Brevis Manual Muscle Testing
- 2-point discrimination
- Semmes-Weinstein Monofilament Test
- CTS-Relief Maneuver (CTS-RM)
- Pin Prick Sensory Deficit; thumb or index or middle finger
- ULNT Criterion C
- Tethered median nerve stress test
- Vibration perception – tuning fork
- Scratch collapse test
- Luthy sign
- Pinwheel

**Strength of Recommendation: Moderate Evidence**

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

**Rationale**
Several moderate and high quality studies provided a moderate level of evidence to suggest that the various tests listed above were not found to have been used as individual tests to rule in or rule out the diagnosis of CTS. CTS-RM had a moderate association to the reference standard when ruling-in CTS according to one high quality study (Gok, 2008) however the generalizability of these results is unclear because the study sample only contained female subjects. Meta-analysis could not be performed on any of these studies due to inconsistent reporting or lack of sufficient evidence. The reference standard for comparison was the use of either electrodiagnostic studies (EDS) following AANEM criteria or other general EDS methods. There is conflicting evidence of whether or not combining tests helps to rule in or rule out the diagnosis of CTS, as the test combinations were not validated or weighted to ensure reliability,
accuracy, and/or clinical relevance; any valid scales are evaluated in the diagnostic scales recommendation.

Risks and Harms of Implementing the Physical Exam and History Interview Recommendations
There are no known harms associated with implementing these recommendations.

Future Research
Future studies should define diagnostic reference standard. The development of standardized diagnostic scales and stand-alone maneuvers or tests should be evaluated against a reference standard. Studies should include appropriate blinding as well as timing between tests to allow for unbiased and accurate assessments.
<table>
<thead>
<tr>
<th>Study</th>
<th>Representative Population</th>
<th>Clear Selection Criteria</th>
<th>Detailed Enough to Replicate</th>
<th>Reference Standard Identifies Target Condition</th>
<th>Blinding</th>
<th>Other Bias?</th>
<th>Inclusion</th>
<th>Strength</th>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>●</td>
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<td>High Quality</td>
</tr>
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<td>Weber,R.A., 2000</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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<tr>
<td>Witt,J.C., 2004</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
</tbody>
</table>
RESULTS

SUMMARY OF DATA FINDINGS

TABLE 6: SUMMARY OF FINDINGS- INDEX TEST VERSUS AANEM REFERENCED EDS

<table>
<thead>
<tr>
<th>Index Test</th>
<th>Rule In/Out</th>
<th>LR +</th>
<th>LR -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpal Compression Test (CCT)</td>
<td>RULE IN</td>
<td>≥10</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>&lt;5 but &lt;10</td>
<td>&gt;0.1 but &lt;0.2</td>
</tr>
<tr>
<td></td>
<td>RULE IN</td>
<td>&lt;2 and &lt;5</td>
<td>&gt;0.2 but &lt;0.5</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>≤2</td>
<td>≥0.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Index Test</th>
<th>Rule In/Out</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flick Sign</td>
<td>RULE IN</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Phalen Test</td>
<td>RULE IN</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Reverse Phalen Test</td>
<td>RULE IN</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Thenar Weakness</td>
<td>RULE IN</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Thumb Abduction Weakness</td>
<td>RULE IN</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td></td>
<td>RULE OUT</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Thenar Atrophy</td>
<td>RULE IN</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Tinel Sign</td>
<td>RULE IN</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>ULNT1; criterion A</td>
<td>RULE IN</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>ULNT1; criterion B</td>
<td>RULE IN</td>
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<td>NA</td>
<td></td>
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<tr>
<td></td>
<td>RULE OUT</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

Table only displays index tests with more than one article of supporting evidence

*EDS method used in the study does not directly reference AAEM criteria and cannot be included in meta-analysis
# TABLE 7: SUMMARY OF FINDINGS- INDEX TEST VERSUS GENERAL EDS METHODS

<table>
<thead>
<tr>
<th>Index Test</th>
<th>Rule In/Out</th>
<th>LR +</th>
<th>LR -</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
<th>Meta-Analysis</th>
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<tr>
<td>2 Point Discrimination</td>
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<td>○</td>
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<td>NA</td>
<td>NA</td>
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</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>○</td>
<td>○</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Carpal Compression Test (CCT)</td>
<td>RULE IN</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>NA</td>
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<td></td>
<td>RULE OUT</td>
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<td>○</td>
<td></td>
<td>NA</td>
<td>NA</td>
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<td>Phalen Test (PT)</td>
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<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>○</td>
<td>○</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
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<td>Tinel Sign (TS)</td>
<td>RULE IN</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td></td>
<td>RULE OUT</td>
<td>○</td>
<td>○</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Phalen Test and Tinel Sign</td>
<td>RULE IN</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>○</td>
<td>○</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Phalen Test or Tinel Sign</td>
<td>RULE IN</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td></td>
<td>RULE OUT</td>
<td>○</td>
<td>○</td>
<td></td>
<td>NA</td>
<td>NA</td>
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</tr>
<tr>
<td>Semmes-Weinstein Monofilament Test (SWMF)</td>
<td>RULE IN</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>○</td>
<td>○</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Thenar Weakness</td>
<td>RULE IN</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
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<td>RULE OUT</td>
<td>○</td>
<td>○</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

Table only displays index tests with more than one article of supporting evidence.
Authors with parenthetical numbers indicate a change in method of EDS, alternate limbs, or alternate examiner.
Authors with parenthetical letters indicate a unique study with the same author and year as another study listed in the guideline.

<table>
<thead>
<tr>
<th>LR +</th>
<th>LR -</th>
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</thead>
<tbody>
<tr>
<td>&gt;10</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>&gt;5 but &lt;10</td>
<td>&gt;0.1 but &lt;0.2</td>
</tr>
<tr>
<td>&gt;2 and &lt;5</td>
<td>&gt;0.2 but &lt;0.5</td>
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<tr>
<td>&lt;2</td>
<td>&gt;0.5</td>
</tr>
</tbody>
</table>

In “STRONG” agreement with the reference standard

In “MODERATE” agreement with the reference standard

In “WEAK” agreement with the reference standard

In “POOR” agreement with the reference standard
## DETAILED DATA FINDINGS

### TABLE 8: HIGH QUALITY STUDIES- PICO 1 (PHYSICAL TESTS VERSUS REFERENCE STANDARD)

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes Reported By</th>
<th>Group1 (Reference Standard)</th>
<th>Group2 (Reference Standard)</th>
<th>Group1 N</th>
<th>Group2 N</th>
<th>PPV</th>
<th>NPV</th>
<th>Sens</th>
<th>Spec</th>
<th>LR+</th>
<th>LR-</th>
<th>Rule In Test</th>
<th>Rule Out Test</th>
</tr>
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<tbody>
<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (2 Point Discrimination)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; 2point; SWMF; both (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; 2point; SWMF; both (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>99</td>
<td>57</td>
<td>0.82</td>
<td>0.14</td>
<td>0.62</td>
<td>0.31</td>
<td>0.90</td>
<td>1.22</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (2 Point Discrimination and Semmes-Weinstein Monofilament Test (SWMF) 1)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; 2point; SWMF; both (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; 2point; SWMF; both (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>119</td>
<td>37</td>
<td>0.82</td>
<td>0.11</td>
<td>0.75</td>
<td>0.15</td>
<td>0.88</td>
<td>1.65</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Semmes-Weinstein Monofilament Test (SWMF) 1)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; 2point; SWMF; both (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; 2point; SWMF; both (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>65</td>
<td>91</td>
<td>0.83</td>
<td>0.16</td>
<td>0.42</td>
<td>0.58</td>
<td>0.98</td>
<td>1.01</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Thenar Atrophy)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>36</td>
<td>120</td>
<td>0.97</td>
<td>0.21</td>
<td>0.27</td>
<td>0.96</td>
<td>7.00</td>
<td>0.76</td>
<td>MODERATE</td>
<td>POOR</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Thenar Weakness)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>46</td>
<td>110</td>
<td>0.96</td>
<td>0.22</td>
<td>0.34</td>
<td>0.92</td>
<td>4.40</td>
<td>0.72</td>
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<td>POOR</td>
</tr>
<tr>
<td>Gok,H., 2008</td>
<td>High Quality</td>
<td>CTS Positive (CTS-RM: Relief maneuver)</td>
<td>all female subjects with CTS symptoms</td>
<td>Subjects</td>
<td>index pos; flick sign; relief maneuver (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; flick sign; relief maneuver (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>51</td>
<td>36</td>
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<tr>
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<td>High Quality</td>
<td>CTS Positive (CTS-RM: Relief maneuver and Flick Sign)</td>
<td>all female subjects with CTS symptoms</td>
<td>Subjects</td>
<td>index pos; flick sign; relief maneuver (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; flick sign; relief maneuver (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>47</td>
<td>0.95</td>
<td>0.57</td>
<td>0.66</td>
<td>0.93</td>
<td>9.50</td>
<td>0.37</td>
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<td>WEAK</td>
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<tr>
<td>Gok,H., 2008</td>
<td>High Quality</td>
<td>CTS Positive (Flick Sign)</td>
<td>all female subjects with CTS symptoms</td>
<td>Subjects</td>
<td>index pos; flick sign; relief maneuver (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; flick sign; relief maneuver (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
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<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
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<td>index neg; PT; TS; 2 point; combinations; combinations with katz (Nerve Conduction Studies (NCS))</td>
<td>27</td>
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<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
<td>index pos; PT; TS; 2 point; combinations; combinations with katz (Nerve Conduction Studies (NCS))</td>
<td>index neg; PT; TS; 2 point; combinations; combinations with katz (Nerve Conduction Studies (NCS))</td>
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<td>42</td>
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<td>0.74</td>
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<td>CTS Positive (Phalen Test and Katz Hand Diagram; classic or probable)</td>
<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
<td>index pos; PT; TS; 2 point; combinations; combinations with katz (Nerve Conduction Studies (NCS))</td>
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<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
<td>index pos; PT; TS; 2 point; combinations; combinations with katz (Nerve Conduction Studies (NCS))</td>
<td>index neg; PT; TS; 2 point; combinations; combinations with katz (Nerve Conduction Studies (NCS))</td>
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<td>68</td>
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<td>0.47</td>
<td>0.45</td>
<td>0.73</td>
<td>1.67</td>
<td>0.75</td>
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<td>POOR</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Katz,J.N., 1990 (B)</td>
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<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
<td>index pos; PT; TS; 2 point; combinations; combinations with katz (Nerve Conduction Studies (NCS))</td>
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<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
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<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
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<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
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<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
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<td>CTS suspected veterans</td>
<td>multiple parameters used within NCS</td>
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<td>55</td>
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<td>0.50</td>
<td>0.59</td>
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<td>0.85</td>
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<td>Naranjo,A., 2007</td>
<td>High Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>68 patients with suspected CTS</td>
<td>determined NCS and US cutoffs</td>
<td>Extremities</td>
<td>index pos; PT, TS, PT/TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; PT, TS, PT/TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>78</td>
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<td>0.76</td>
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<td>68 patients with suspected CTS</td>
<td>determined NCS and US cutoffs</td>
<td>Extremities</td>
<td>index pos; PT, TS, PT/TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; PT, TS, PT/TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>81</td>
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<td>High Quality</td>
<td>CTS Positive (Thenar Atrophy)</td>
<td>68 patients with suspected CTS</td>
<td>determined NCS and US cutoffs</td>
<td>Extremities</td>
<td>index pos; thenar atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; thenar atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Outcomes Reported By</td>
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<td>Group 2 (Reference Standard)</td>
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<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<tr>
<td>Naranjo,A., 2007</td>
<td>High Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>68 patients with suspected CTS</td>
<td>determined NCS and US cutoffs</td>
<td>Extremities</td>
<td>index pos; PT, TS, PT/TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>31</td>
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<td>Ntani,G., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>responders from all suspected CTS out-patients</td>
<td>SNC abnormality</td>
<td>Extremities</td>
<td>index pos; TS; PT (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC))</td>
<td>index neg; TS; PT (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC))</td>
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<td>1.32</td>
<td>0.76</td>
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<td>Ntani,G., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Thenar Weakness)</td>
<td>responders from all suspected CTS out-patients</td>
<td>SNC abnormality</td>
<td>Extremities</td>
<td>index pos; thenar weakness; pain (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC))</td>
<td>index neg; thenar weakness; pain (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC))</td>
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<td>CTS Positive (Tinel Sign)</td>
<td>responders from all suspected CTS out-patients</td>
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<td>Extremities</td>
<td>index pos; TS; PT (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC))</td>
<td>index neg; TS; PT (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC))</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Pagel,K.J., 2002</td>
<td>High</td>
<td>CTS Positive (Semmes-Weinstein Monofilament Test (SWMF) 1)</td>
<td>symptoms of suspected CTS</td>
<td>two cutoff values for each SWMF method; NCS by palm diff median to ulnar latency</td>
<td>Subjects</td>
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<td>index neg; SWMF 1, 2 (Nerve Conduction Studies (NCS))</td>
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<td>CTS Positive (Semmes-Weinstein Monofilament Test (SWMF) 2)</td>
<td>symptoms of suspected CTS</td>
<td>two cutoff values for each SWMF method; NCS by palm diff median to ulnar latency</td>
<td>Subjects</td>
<td>index pos; SWMF 1, 2 (Nerve Conduction Studies (NCS))</td>
<td>index neg; SWMF 1, 2 (Nerve Conduction Studies (NCS))</td>
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<td>98</td>
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<td>0.47</td>
<td>0.13</td>
<td>0.87</td>
<td>1.01</td>
<td>1.00</td>
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<tr>
<td>Tan,S.V., 2012</td>
<td>Moderate</td>
<td>CTS Positive (Phalen Test)</td>
<td>limbs of 100 CTS suspects</td>
<td>at least 2 abnormal EDS parameters</td>
<td>Extremities</td>
<td>index pos; PT; TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; PT; TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.75</td>
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<td>Tan,S.V., 2012</td>
<td>Moderate</td>
<td>CTS Positive (Tinel Sign)</td>
<td>limbs of 100 CTS suspects</td>
<td>at least 2 abnormal EDS parameters</td>
<td>Extremities</td>
<td>index pos; PT; TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; PT; TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Vanti,C., 2011</td>
<td>High</td>
<td>CTS Positive (ULNT1; criterion A)</td>
<td>47 clinical CTS suspects; 3 did not complete tests</td>
<td>symptoms and reduced scv-wp</td>
<td>Subjects</td>
<td>index pos; ULNT1, A, A/B/C (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>19</td>
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<td>0.54</td>
<td>0.70</td>
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<td>0.65</td>
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<tr>
<td>Vanti,C., 2011</td>
<td>High</td>
<td>CTS Positive (ULNT1; criterion A, B, and C)</td>
<td>47 clinical CTS suspects; 3 did not complete tests</td>
<td>symptoms and reduced scv-wp</td>
<td>Subjects</td>
<td>index pos; ULNT1, A, A/B/C (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>index neg; ULNT1, A, A/B/C (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Vanti,C., 2012</td>
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<td>limbs of 47 patients</td>
<td>Extremities</td>
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<td>Extremities</td>
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<td>0.29</td>
<td>0.82</td>
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<td>Vanti,C., 2012</td>
<td>High</td>
<td>CTS Positive (ULNT1; criterion C)</td>
<td>limbs of 47 patients</td>
<td>Extremities</td>
<td>index pos; ULNT1, A, B, C (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
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<td>LR-</td>
<td>Rule In Test</td>
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<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Abductor Pollicis Brevis Manual Muscle Testing)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; ULNT1, A, B; TS, TS 2; CCT; PT; Flick (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>11</td>
<td>index neg; ULNT1, A, B; TS, TS 2; CCT; PT; Flick (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<tr>
<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Carpal Compression Test (CCT))</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
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<td>index neg; ULNT1, A, B; TS, TS 2; CCT; PT; Flick (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Group2 (Reference Standard)</td>
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<td>LR-</td>
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<td>Group 2 (Reference Standard)</td>
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<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
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<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Bilkis,S., 2012</td>
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<td>CTS Positive (Modified Phalen Test)</td>
<td>37 patients with comorbidities excluded</td>
<td>determined mixed nerve NCS cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; MPT (Nerve Conduction Studies (NCS))</td>
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<td>37 patients with comorbidities excluded</td>
<td>determined mixed nerve NCS cutoffs</td>
<td>Extremities</td>
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<td>Extremities</td>
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<td>CTS Positive (Modified Carpal Compression Test (MCCT))</td>
<td>43 hands of CTS suspects referenced median and mixed nerve cutoffs</td>
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<td>Extremities</td>
<td>index pos; PT; MCCT; PT or MCCT with no thenar sensory deficit (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>43 hands of CTS suspects referenced median and mixed nerve cutoffs</td>
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<td>Group2 N</td>
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<td>Rule In Test</td>
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<td>Boland,R.A., 2009</td>
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<td>CTS Positive (Phalen Test and no thenar sensory deficit)</td>
<td>43 hands of CTS suspects</td>
<td>referenced median and mixed nerve cutoffs</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
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<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
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<td>Dale,A.M., 2011 (1) Moderate Quality CTS Positive (Phalen Test, Tinel Sign, and Semmes-Weinstein Monofilament Test 1) 1108 recruits from 11 occupations of potential CTS risk sensory, motor, and MUDS cutoffs Extremities index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable) 8 index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable) 1100 0.13</td>
<td>0.99</td>
<td>0.09</td>
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<td>0.91</td>
<td>STRONG</td>
<td>POOR</td>
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<td>Dale,A.M., 2011 (1) Moderate Quality CTS Positive (Semmes-Weinstein Monofilament Test (SWMF) 1) 1108 recruits from 11 occupations of potential CTS risk sensory, motor, and MUDS cutoffs Extremities index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable) 291 index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable) 817 0.02</td>
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<td>0.61</td>
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<td>Dale,A.M., 2011 (1) Moderate Quality CTS Positive (Tinel Sign) 1108 recruits from 11 occupations of potential CTS risk sensory, motor, and MUDS cutoffs Extremities index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable) 120 index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable) 988 0.03</td>
<td>0.99</td>
<td>0.27</td>
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<td>2.56</td>
<td>0.81</td>
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<td>Dale,A.M., 2011 (1) Moderate Quality CTS Positive (Tinel Sign and Semmes-Weinstein Monofilament Test 1) 1108 recruits from 11 occupations of potential CTS risk sensory, motor, and MUDS cutoffs Extremities index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable) 39 index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable) 1069 0.05</td>
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<td>5.39</td>
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<td>POOR</td>
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<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Moderate Quality</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>101</td>
<td>1007</td>
<td>0.30</td>
<td>0.77</td>
<td>0.11</td>
<td>0.92</td>
<td>1.36</td>
<td>0.97</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
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<td>index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
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<td>1077</td>
<td>0.39</td>
<td>0.77</td>
<td>0.05</td>
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<td>2.03</td>
<td>0.98</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>25</td>
<td>1083</td>
<td>0.24</td>
<td>0.76</td>
<td>0.02</td>
<td>0.98</td>
<td>1.01</td>
<td>1.00</td>
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<td>CTS Positive (Phalen Test, Tinel Sign, and Semmes-Weinstein Monofilament Test 1)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>7</td>
<td>1101</td>
<td>0.14</td>
<td>0.76</td>
<td>0.00</td>
<td>0.99</td>
<td>0.54</td>
<td>1.00</td>
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<td>Dale,A.M., 2011 (2)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Semmes-Weinstein Monofilament Test (SWMF 1))</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>290</td>
<td>818</td>
<td>0.32</td>
<td>0.79</td>
<td>0.36</td>
<td>0.77</td>
<td>1.54</td>
<td>0.84</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>120</td>
<td>988</td>
<td>0.29</td>
<td>0.77</td>
<td>0.13</td>
<td>0.90</td>
<td>1.32</td>
<td>0.96</td>
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<td>Moderate Quality</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>index neg; LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>39</td>
<td>1069</td>
<td>0.36</td>
<td>0.77</td>
<td>0.05</td>
<td>0.97</td>
<td>1.80</td>
<td>0.98</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>Dale,A.M., 2011 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (At least Phalen Test, Tinel Sign, or Semmes-Weinstein Monofilament Test 1)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>443</td>
<td>665</td>
<td>0.37</td>
<td>0.79</td>
<td>0.54</td>
<td>0.65</td>
<td>1.57</td>
<td>0.70</td>
<td>POOR</td>
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<td>Dale,A.M., 2011 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>104</td>
<td>1004</td>
<td>0.36</td>
<td>0.73</td>
<td>0.12</td>
<td>0.92</td>
<td>1.45</td>
<td>0.96</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test and Semmes-Weinstein Monofilament Test 1)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>51</td>
<td>1057</td>
<td>0.49</td>
<td>0.73</td>
<td>0.08</td>
<td>0.97</td>
<td>2.52</td>
<td>0.95</td>
<td>WEAK</td>
<td>POOR</td>
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<td>Dale,A.M., 2011 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test and Tinel Sign)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
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<td>1073</td>
<td>0.37</td>
<td>0.73</td>
<td>0.04</td>
<td>0.97</td>
<td>1.55</td>
<td>0.98</td>
<td>POOR</td>
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<td>Dale,A.M., 2011 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test, Tinel Sign, and Semmes-Weinstein Monofilament Test 1)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
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<td>0.73</td>
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<td>1.41</td>
<td>0.99</td>
<td>POOR</td>
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<td>Dale,A.M., 2011 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Semmes-Weinstein Monofilament Test (SWMF) 1)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td>340</td>
<td>768</td>
<td>0.41</td>
<td>0.78</td>
<td>0.45</td>
<td>0.75</td>
<td>1.79</td>
<td>0.73</td>
<td>POOR</td>
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<td>Dale,A.M., 2011 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
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<td>981</td>
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<td>1.76</td>
<td>0.92</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Moderate Quality</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS))</td>
<td></td>
<td>59</td>
<td>1049</td>
<td>0.49</td>
<td>0.74</td>
<td>0.09</td>
<td>0.96</td>
<td>2.53</td>
<td>0.94</td>
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<td>CTS Positive (At least Phalen Test, Tinel Sign, or Semmes-Weinstein Monofilament Test 1)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td></td>
<td>445</td>
<td>663</td>
<td>0.04</td>
<td>0.99</td>
<td>0.67</td>
<td>0.60</td>
<td>1.68</td>
<td>0.55</td>
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<td>CTS Positive (Phalen Test)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td></td>
<td>51</td>
<td>1057</td>
<td>0.14</td>
<td>0.98</td>
<td>0.29</td>
<td>0.96</td>
<td>7.19</td>
<td>0.74</td>
<td>MODERATE</td>
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<td>CTS Positive (Phalen Test and Tinel Sign)</td>
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<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
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<td>0.98</td>
<td>0.08</td>
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<td>0.95</td>
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<td>POOR</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>Dale,A.M., 2011 (4)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test, Tinel Sign, and Semmes-Weinstein Monofilament Test 1)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>19</td>
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<td>0.98</td>
<td>5.31</td>
<td>0.93</td>
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<td>CTS Positive (Semmes-Weinstein Monofilament Test (SWMF) 1)</td>
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<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
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<td>342</td>
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<td>766</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>127</td>
<td>index neg; RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>981</td>
<td>0.05</td>
<td>0.98</td>
<td>0.25</td>
<td>0.89</td>
<td>2.24</td>
<td>0.84</td>
<td>WEAK</td>
<td>POOR</td>
</tr>
<tr>
<td>Dale,A.M., 2011 (4)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign and Semmes-Weinstein Monofilament Test 1)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>60</td>
<td>index neg; RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>1048</td>
<td>0.10</td>
<td>0.98</td>
<td>0.25</td>
<td>0.95</td>
<td>5.02</td>
<td>0.79</td>
<td>MODERATE</td>
<td>POOR</td>
</tr>
<tr>
<td>Dale,A.M., 2011 (5)</td>
<td>Moderate Quality</td>
<td>CTS Positive (At least Phalen Test, Tinel Sign, or Semmes-Weinstein Monofilament Test 1)</td>
<td>76 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>44</td>
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<td>32</td>
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<td>0.88</td>
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<td>0.84</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Dale,A.M., 2011 (5)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>76 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: LEFT HAND; PT; TS; SWMFI; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>20</td>
<td>index neg; SYMPT: LEFT HAND; PT; TS; SWMFI; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>56</td>
<td>0.10</td>
<td>0.84</td>
<td>0.18</td>
<td>0.72</td>
<td>0.66</td>
<td>1.13</td>
<td>POOR</td>
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<td>Dale,A.M., 2011 (5)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test and Semmes-Weinstein Monofilament Test 1)</td>
<td>76 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: LEFT HAND; PT; TS; SWMFI; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>8</td>
<td>index neg; SYMPT: LEFT HAND; PT; TS; SWMFI; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>68</td>
<td>0.25</td>
<td>0.87</td>
<td>0.18</td>
<td>0.91</td>
<td>1.97</td>
<td>0.90</td>
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<td>CTS Positive (Phalen Test and Tinel Sign)</td>
<td>76 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
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<td>6</td>
<td>index neg; SYMPT: LEFT HAND; PT; TS; SWMFI; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>70</td>
<td>0.17</td>
<td>0.86</td>
<td>0.09</td>
<td>0.92</td>
<td>1.18</td>
<td>0.98</td>
<td>POOR</td>
<td>POOR</td>
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<td>Dale,A.M., 2011 (5)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test, Tinel Sign, and Semmes-Weinstein Monofilament Test 1)</td>
<td>76 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: LEFT HAND; PT; TS; SWMFI; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>2</td>
<td>index neg; SYMPT: LEFT HAND; PT; TS; SWMFI; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>74</td>
<td>0.50</td>
<td>0.86</td>
<td>0.09</td>
<td>0.98</td>
<td>5.91</td>
<td>0.92</td>
<td>MODERATE</td>
<td>POOR</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Dale,A.M., 2011 (5)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Semmes-Weinstein Monofilament Test (SWMF) 1)</td>
<td>76 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>index neg; SYMPT: LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>30</td>
<td>46</td>
<td>0.20</td>
<td>0.89</td>
<td>0.55</td>
<td>0.63</td>
<td>1.48</td>
<td>0.72</td>
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<td>CTS Positive (Tinel Sign)</td>
<td>76 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
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<td>index neg; SYMPT: LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>14</td>
<td>62</td>
<td>0.21</td>
<td>0.87</td>
<td>0.27</td>
<td>0.83</td>
<td>1.61</td>
<td>0.88</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Dale,A.M., 2011 (5)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign and Semmes-Weinstein Monofilament Test 1)</td>
<td>76 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>index neg; SYMPT: LEFT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>8</td>
<td>68</td>
<td>0.25</td>
<td>0.87</td>
<td>0.18</td>
<td>0.91</td>
<td>1.97</td>
<td>0.90</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Dale,A.M., 2011 (6)</td>
<td>Moderate Quality</td>
<td>CTS Positive (At least Phalen Test, Tinel Sign, or Semmes-Weinstein Monofilament Test 1)</td>
<td>113 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>index neg; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>73</td>
<td>40</td>
<td>0.19</td>
<td>0.83</td>
<td>0.67</td>
<td>0.36</td>
<td>1.04</td>
<td>0.93</td>
<td>POOR</td>
<td>POOR</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Dale,A.M., 2011 (6)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>113 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>index neg; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>28</td>
<td>85</td>
<td>0.21</td>
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<td>0.76</td>
<td>1.19</td>
<td>0.94</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Dale,A.M., 2011 (6)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test and Semmes-Weinstein Monofilament Test 1)</td>
<td>113 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>index neg; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>19</td>
<td>94</td>
<td>0.32</td>
<td>0.84</td>
<td>0.29</td>
<td>0.86</td>
<td>2.02</td>
<td>0.83</td>
<td>WEAK</td>
<td>POOR</td>
</tr>
<tr>
<td>Dale,A.M., 2011 (6)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test and Tinel Sign)</td>
<td>113 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>index neg; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>9</td>
<td>104</td>
<td>0.22</td>
<td>0.82</td>
<td>0.10</td>
<td>0.92</td>
<td>1.25</td>
<td>0.98</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Dale,A.M., 2011 (6)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test, Tinel Sign, and Semmes-Weinstein Monofilament Test 1)</td>
<td>113 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>index neg; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
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<td>0.82</td>
<td>0.10</td>
<td>0.97</td>
<td>2.92</td>
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<td>WEAK</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>Dale, A.M., 2011 (6)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Semmes-Weinstein Monofilament Test)</td>
<td>113 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>59</td>
<td>index neg; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>54</td>
<td>0.24</td>
<td>0.87</td>
<td>0.67</td>
<td>0.51</td>
<td>1.36</td>
<td>0.65</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Dale, A.M., 2011 (6)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>113 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>26</td>
<td>index neg; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>87</td>
<td>0.19</td>
<td>0.82</td>
<td>0.24</td>
<td>0.77</td>
<td>1.04</td>
<td>0.99</td>
<td>POOR</td>
<td>POOR</td>
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<td>Dale, A.M., 2011 (6)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign and Semmes-Weinstein Monofilament Test)</td>
<td>113 clinically suspected symptomatic hands</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>17</td>
<td>index neg; SYMPT: RIGHT HAND; PT; TS; SWMF1; combinations (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>96</td>
<td>0.29</td>
<td>0.83</td>
<td>0.24</td>
<td>0.87</td>
<td>1.83</td>
<td>0.88</td>
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<tr>
<td>De Krom, M.C., 1990</td>
<td>Moderate Quality</td>
<td>CTS Positive (Abductor Pollicis Brevis Pareisis)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Extremities</td>
<td>index pos; Flick; PT; TS; RPT; CCT; Luthy; Hypagalsia; Hyperpathia; Thenar; OP; APB; tourniquet (Nerve Conduction Studies (NCS))</td>
<td>27</td>
<td>index neg; Flick; PT; TS; RPT; CCT; Luthy; Hypagalsia; Hyperpathia; Thenar; OP; APB; tourniquet (Nerve Conduction Studies (NCS))</td>
<td>66</td>
<td>0.63</td>
<td>0.59</td>
<td>0.39</td>
<td>0.80</td>
<td>1.89</td>
<td>0.77</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>De Krom, M.C., 1990</td>
<td>Moderate Quality</td>
<td>CTS Positive (Carpal Compression Test (CCT))</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Extremities</td>
<td>index pos; Flick; PT; TS; RPT; CCT; Luthy; Hypagalsia; Hyperpathia; Thenar; OP; APB; tourniquet (Nerve Conduction Studies (NCS))</td>
<td>5</td>
<td>index neg; Flick; PT; TS; RPT; CCT; Luthy; Hypagalsia; Hyperpathia; Thenar; OP; APB; tourniquet (Nerve Conduction Studies (NCS))</td>
<td>88</td>
<td>0.40</td>
<td>0.52</td>
<td>0.05</td>
<td>0.94</td>
<td>0.74</td>
<td>1.02</td>
<td>POOR</td>
<td>POOR</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 N</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 N</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>De Krom,M.C., 1990</td>
<td>Moderate</td>
<td>CTS Positive (Flick Sign)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Extremities</td>
<td>41</td>
<td>index pos; Flick; PT; TS; RPT; CCT; Luthy; Hypagalsia; Hyperpathia; Thenar; OP; AB; tourniquet (Nerve Conduction Studies (NCS))</td>
<td>52</td>
<td>0.54</td>
<td>0.58</td>
<td>0.50</td>
<td>0.61</td>
<td>1.29</td>
<td>0.82</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>De Krom,M.C., 1990</td>
<td>Moderate</td>
<td>CTS Positive (Hypalgesia; pinwheel)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Extremities</td>
<td>37</td>
<td>index pos; Flick; PT; TS; RPT; CCT; Luthy; Hypagalsia; Hyperpathia; Thenar; OP; AB; tourniquet (Nerve Conduction Studies (NCS))</td>
<td>56</td>
<td>0.46</td>
<td>0.52</td>
<td>0.39</td>
<td>0.59</td>
<td>0.95</td>
<td>1.04</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>De Krom,M.C., 1990</td>
<td>Moderate</td>
<td>CTS Positive (Hyperpathia; pinwheel)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Extremities</td>
<td>16</td>
<td>index pos; Flick; PT; TS; RPT; CCT; Luthy; Hypagalsia; Hyperpathia; Thenar; OP; AB; tourniquet (Nerve Conduction Studies (NCS))</td>
<td>77</td>
<td>0.69</td>
<td>0.57</td>
<td>0.25</td>
<td>0.90</td>
<td>2.45</td>
<td>0.84</td>
<td>WEAK</td>
<td>POOR</td>
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<tr>
<td>De Krom,M.C., 1990</td>
<td>Moderate</td>
<td>CTS Positive (Luthy Sign)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Extremities</td>
<td>32</td>
<td>index pos; Flick; PT; TS; RPT; CCT; Luthy; Hypagalsia; Hyperpathia; Thenar; OP; AB; tourniquet (Nerve Conduction Studies (NCS))</td>
<td>61</td>
<td>0.59</td>
<td>0.59</td>
<td>0.43</td>
<td>0.73</td>
<td>1.63</td>
<td>0.77</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>De Krom,M.C., 1990</td>
<td>Moderate</td>
<td>CTS Positive (Opponens Pollicis Paresis)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Extremities</td>
<td>12</td>
<td>index pos; Flick; PT; TS; RPT; CCT; Luthy; Hypagalsia; Hyperpathia; Thenar; OP; AB; tourniquet (Nerve Conduction Studies (NCS))</td>
<td>81</td>
<td>0.42</td>
<td>0.52</td>
<td>0.11</td>
<td>0.86</td>
<td>0.80</td>
<td>1.03</td>
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<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>De Krom,M.C., 1990</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Externities</td>
<td>reported by</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<td>De Krom,M.C., 1990</td>
<td>Moderate Quality</td>
<td>CTS Positive (Reverse Phalen Test)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Externities</td>
<td>reported by</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td></td>
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<tr>
<td>De Krom,M.C., 1990</td>
<td>Moderate Quality</td>
<td>CTS Positive (Thenar Atrophy)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Externities</td>
<td>reported by</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td></td>
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<tr>
<td>De Krom,M.C., 1990</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Externities</td>
<td>reported by</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<td>De Krom,M.C., 1990</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tourniquet Test)</td>
<td>random selection of general pop with 50 that admitted to persistent CTS symptoms</td>
<td>DML and DSL with referenced normal values</td>
<td>Externities</td>
<td>reported by</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<tr>
<td>De,Smet L., 1995</td>
<td>Moderate</td>
<td>CTS Positive (Durkan Test)</td>
<td>54 confirmed CTS limbs; 12 symptomatic unconfirmed</td>
<td>Slowing conduction velocity and DML</td>
<td>Extremities</td>
<td>index pos; PT; Durkan (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; PT; Durkan (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>42</td>
<td>24</td>
<td>0.81</td>
<td>0.17</td>
<td>0.63</td>
<td>0.33</td>
<td>0.94</td>
<td>1.11</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>De,Smet L., 1995</td>
<td>Moderate</td>
<td>CTS Positive (Phalen Test)</td>
<td>54 confirmed CTS limbs; 12 symptomatic unconfirmed</td>
<td>Slowing conduction velocity and DML</td>
<td>Extremities</td>
<td>index pos; PT; Durkan (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; PT; Durkan (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>57</td>
<td>9</td>
<td>0.86</td>
<td>0.44</td>
<td>0.91</td>
<td>0.33</td>
<td>1.36</td>
<td>0.28</td>
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<tr>
<td>El,Miedany Y., 2008</td>
<td>Moderate</td>
<td>CTS Positive (Carpal Compression Test (CCT))</td>
<td>clinically diagnosed CTS suspects; large tenosynovitis prevalence</td>
<td>comparative, sensory, or motor abnormality</td>
<td>Subjects</td>
<td>index pos; PT; TS; RPT; CCT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; PT; TS; RPT; CCT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>120</td>
<td>112</td>
<td>0.70</td>
<td>0.11</td>
<td>0.46</td>
<td>0.25</td>
<td>0.61</td>
<td>2.17</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>El,Miedany Y., 2008</td>
<td>Moderate</td>
<td>CTS Positive (Phalen Test)</td>
<td>clinically diagnosed CTS suspects; large tenosynovitis prevalence</td>
<td>comparative, sensory, or motor abnormality</td>
<td>Subjects</td>
<td>index pos; PT; TS; RPT; CCT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; PT; TS; RPT; CCT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>127</td>
<td>105</td>
<td>0.69</td>
<td>0.08</td>
<td>0.47</td>
<td>0.17</td>
<td>0.57</td>
<td>3.16</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>El,Miedany Y., 2008</td>
<td>Moderate</td>
<td>CTS Positive (Reverse Phalen Test)</td>
<td>clinically diagnosed CTS suspects; large tenosynovitis prevalence</td>
<td>comparative, sensory, or motor abnormality</td>
<td>Subjects</td>
<td>index pos; PT; TS; RPT; CCT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; PT; TS; RPT; CCT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>108</td>
<td>124</td>
<td>0.71</td>
<td>0.14</td>
<td>0.42</td>
<td>0.35</td>
<td>0.65</td>
<td>1.64</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>El,Miedany Y., 2008</td>
<td>Moderate</td>
<td>CTS Positive (Tinel Sign)</td>
<td>clinically diagnosed CTS suspects; large tenosynovitis prevalence</td>
<td>comparative, sensory, or motor abnormality</td>
<td>Subjects</td>
<td>index pos; PT; TS; RPT; CCT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; PT; TS; RPT; CCT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>72</td>
<td>160</td>
<td>0.76</td>
<td>0.19</td>
<td>0.30</td>
<td>0.65</td>
<td>0.84</td>
<td>1.09</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Gerr,F., 1998</td>
<td>Moderate</td>
<td>CTS Positive (2 Point Discrimination)</td>
<td>60 symptomatic patient hands suspected of CTS</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; vib perception; 2point (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; PT; TS; vib perception; 2point (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>21</td>
<td>94</td>
<td>0.43</td>
<td>0.49</td>
<td>0.16</td>
<td>0.79</td>
<td>0.76</td>
<td>1.06</td>
<td>POOR</td>
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<td>Reference Title</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Gerr,F., 1998</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>60 symptomatic patient hands suspected of CTS</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; vib perception; 2point (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; PT; TS; vib perception; 2point (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>48</td>
<td>67</td>
<td>0.52</td>
<td>0.52</td>
<td>0.44</td>
<td>0.60</td>
<td>1.11</td>
<td>0.93</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Gerr,F., 1998</td>
<td>Moderate Quality</td>
<td>CTS Positive (Thenar Atrophy)</td>
<td>60 symptomatic patient hands suspected of CTS</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; thenar weakness; thenar atrophy (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; thenar weakness; thenar atrophy (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>15</td>
<td>100</td>
<td>0.60</td>
<td>0.52</td>
<td>0.16</td>
<td>0.90</td>
<td>1.53</td>
<td>0.94</td>
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<td>POOR</td>
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<td>Gerr,F., 1998</td>
<td>Moderate Quality</td>
<td>CTS Positive (Thenar Weakness)</td>
<td>60 symptomatic patient hands suspected of CTS</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; thenar weakness; thenar atrophy (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; thenar weakness; thenar atrophy (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>34</td>
<td>81</td>
<td>0.62</td>
<td>0.56</td>
<td>0.37</td>
<td>0.78</td>
<td>1.64</td>
<td>0.81</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Gerr,F., 1998</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>60 symptomatic patient hands suspected of CTS</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; vib perception; 2point (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; PT; TS; vib perception; 2point (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>19</td>
<td>96</td>
<td>0.42</td>
<td>0.49</td>
<td>0.14</td>
<td>0.81</td>
<td>0.74</td>
<td>1.06</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Gerr,F., 1998</td>
<td>Moderate Quality</td>
<td>CTS Positive (Vibration Perception; tuning fork; index finger)</td>
<td>60 symptomatic patient hands suspected of CTS</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; vib perception; 2point (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; PT; TS; vib perception; 2point (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>30</td>
<td>85</td>
<td>0.67</td>
<td>0.56</td>
<td>0.35</td>
<td>0.83</td>
<td>2.04</td>
<td>0.78</td>
<td>WEAK</td>
<td>POOR</td>
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<tr>
<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (At least Phalen Test, Tinel Sign, or Reverse Phalen Test)</td>
<td>subset of total 3907 limbs examined from NCS referred patients</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; RPT; PT, RPT, or TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; PT; TS; RPT; PT, RPT, or TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>442</td>
<td>485</td>
<td>0.59</td>
<td>0.73</td>
<td>0.66</td>
<td>0.66</td>
<td>1.94</td>
<td>0.51</td>
<td>POOR</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<tr>
<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>subset of total 3907 limbs examined from NCS referred patients</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; RPT; PT, RPT, or TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>366</td>
<td>index neg; PT; TS; RPT; PT, RPT, or TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>561</td>
<td>0.60</td>
<td>0.70</td>
<td>0.56</td>
<td>0.73</td>
<td>2.07</td>
<td>0.60</td>
<td>WEAK</td>
<td>POOR</td>
</tr>
<tr>
<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Reverse Phalen Test)</td>
<td>subset of total 3907 limbs examined from NCS referred patients</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; RPT; PT, RPT, or TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>279</td>
<td>index neg; PT; TS; RPT; PT, RPT, or TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>648</td>
<td>0.64</td>
<td>0.67</td>
<td>0.46</td>
<td>0.81</td>
<td>2.42</td>
<td>0.67</td>
<td>WEAK</td>
<td>POOR</td>
</tr>
<tr>
<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Thenar Atrophy)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>54</td>
<td>index neg; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>873</td>
<td>0.91</td>
<td>0.61</td>
<td>0.13</td>
<td>0.99</td>
<td>13.43</td>
<td>0.88</td>
<td>STRONG</td>
<td>POOR</td>
</tr>
<tr>
<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Thenar Weakness)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>1482</td>
<td>index neg; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>2425</td>
<td>0.43</td>
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<td>0.64</td>
<td>1.17</td>
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<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>subset of total 3907 limbs examined from NCS referred patients</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; RPT; PT, RPT, or TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>215</td>
<td>index neg; PT; TS; RPT; PT, RPT, or TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>2.27</td>
<td>0.77</td>
<td>WEAK</td>
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<td>Hansen,P.A., 2004</td>
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<td>referred CTS suspects</td>
<td>CSI digit diff result and DML cutoffs</td>
<td>Subjects</td>
<td>index pos; Flick sign; PT; TS; combinations (Nerve Conduction Studies (NCS))</td>
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<td>index neg; Flick sign; PT; TS; combinations (Nerve Conduction Studies (NCS))</td>
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<td>0.85</td>
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<td>Outcomes Reported By</td>
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<td>Group1 (Reference Standard)</td>
<td>Group1 PPV</td>
<td>NPV Sens</td>
<td>Spec LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>referred CTS suspects</td>
<td>CSI digit diff result and DML cutoffs</td>
<td>Subjects</td>
<td>index pos; Flick sign; PT; TS; combinations (Nerve Conduction Studies (NCS))</td>
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<td>0.82</td>
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<td>referred CTS suspects</td>
<td>CSI digit diff result and DML cutoffs</td>
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<td>referred CTS suspects</td>
<td>CSI digit diff result and DML cutoffs</td>
<td>Subjects</td>
<td>index pos; Flick sign; PT; TS; combinations (Nerve Conduction Studies (NCS))</td>
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<td>referred CTS suspects</td>
<td>CSI digit diff result and DML cutoffs</td>
<td>Subjects</td>
<td>index pos; Flick sign; PT; TS; combinations (Nerve Conduction Studies (NCS))</td>
<td>52</td>
<td>index neg; Flick sign; PT; TS; combinations (Nerve Conduction Studies (NCS))</td>
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<td>0.81</td>
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<td>referred CTS suspects</td>
<td>CSI digit diff result and DML cutoffs</td>
<td>Subjects</td>
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<td>Heller,L., 1986, Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>60 referrals of CTS suspects</td>
<td>EMG motor latency measure</td>
<td>Extremities</td>
<td>index pos; PT, TS, PT/TS, PT or TS (Electromyography (EMG))</td>
<td>48</td>
<td>index neg; PT, TS, PT/TS, PT or TS (Electromyography (EMG))</td>
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<td>Heller,L., 1986, Moderate Quality</td>
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<td>60 referrals of CTS suspects</td>
<td>EMG motor latency measure</td>
<td>Extremities</td>
<td>index pos; PT, TS, PT/TS, PT or TS (Electromyography (EMG))</td>
<td>29</td>
<td>index neg; PT, TS, PT/TS, PT or TS (Electromyography (EMG))</td>
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<td>0.93</td>
<td>0.39</td>
<td>0.47</td>
<td>0.91</td>
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<td>Heller,L., 1986, Moderate Quality</td>
<td>CTS Positive (Phalen Test or Tinel Sign)</td>
<td>60 referrals of CTS suspects</td>
<td>EMG motor latency measure</td>
<td>Extremities</td>
<td>index pos; PT, TS, PT/TS, PT or TS (Electromyography (EMG))</td>
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<td>Heller,L., 1986, Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>60 referrals of CTS suspects</td>
<td>EMG motor latency measure</td>
<td>Extremities</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+-</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>Karl,A.I., 2001</td>
<td>Moderate Quality</td>
<td>CTS Positive (Lumbrical Provocation Test (LPT))</td>
<td>96 veterans; 90 men and 6 women with median symptoms</td>
<td>palm diff median to ulnar latency; D2-D5 latency; or motor diff</td>
<td>Subjects</td>
<td>index pos; LPT (Nerve Conduction Studies (NCS))</td>
<td>32</td>
<td>index neg; LPT (Nerve Conduction Studies (NCS))</td>
<td>64</td>
<td>0.59</td>
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<td>0.37</td>
<td>0.71</td>
<td>1.29</td>
<td>0.88</td>
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<td>Katz,J.N., 1991</td>
<td>Moderate Quality</td>
<td>CTS Positive (2 Point Discrimination)</td>
<td>CTS symptomatic subjects at one hospital</td>
<td>referenced motor and sensory latency cutoffs</td>
<td>Subjects</td>
<td>index pos; PT; TS; 2point (Nerve Conduction Studies (NCS))</td>
<td>16</td>
<td>index neg; PT; TS; 2point (Nerve Conduction Studies (NCS))</td>
<td>62</td>
<td>0.44</td>
<td>0.63</td>
<td>0.23</td>
<td>0.81</td>
<td>1.24</td>
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<td>Katz,J.N., 1991</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>CTS symptomatic subjects at one hospital</td>
<td>referenced motor and sensory latency cutoffs</td>
<td>Subjects</td>
<td>index pos; PT; TS; 2point (Nerve Conduction Studies (NCS))</td>
<td>53</td>
<td>index neg; PT; TS; 2point (Nerve Conduction Studies (NCS))</td>
<td>25</td>
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<td>0.74</td>
<td>0.63</td>
<td>0.67</td>
<td>1.90</td>
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<td>Katz,J.N., 1991</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>CTS symptomatic subjects at one hospital</td>
<td>referenced motor and sensory latency cutoffs</td>
<td>Subjects</td>
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<td>0.62</td>
<td>1.37</td>
<td>0.77</td>
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<tr>
<td>Kaul,M.P., 2001</td>
<td>Moderate Quality</td>
<td>CTS Positive (Carpal Compression Test (CCT))</td>
<td>consecutive veterans with CTS symptoms</td>
<td>motor, sensory, and mixed nerve latencies and digit diff</td>
<td>Subjects</td>
<td>index pos; PPT; CCT (Nerve Conduction Studies (NCS))</td>
<td>63</td>
<td>index neg; PPT; CCT (Nerve Conduction Studies (NCS))</td>
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<td>Kaul,M.P., 2001</td>
<td>Moderate Quality</td>
<td>CTS Positive (Pressure Provocative Test (PPT))</td>
<td>consecutive veterans with CTS symptoms</td>
<td>motor, sensory, and mixed nerve latencies and digit diff</td>
<td>Subjects</td>
<td>index pos; PPT; CCT (Nerve Conduction Studies (NCS))</td>
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<td>Kuhlman,K.A., 1997</td>
<td>Moderate Quality</td>
<td>CTS Positive (Carpal Compression Test (CCT))</td>
<td>143 clinical CTS suspects</td>
<td>referenced sensory and motor cutoffs</td>
<td>Extremities</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Hypesthesia; pinwheel)</td>
<td>143 clinical CTS suspects</td>
<td>referenced sensory and motor cutoffs</td>
<td>Extremities</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
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<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>143 clinical CTS suspects</td>
<td>referenced sensory and motor cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; Hypesthesia; APB weakness; median compression (Nerve Conduction Studies (NCS))</td>
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<td>CTS Positive (Thenar Weakness)</td>
<td>143 clinical CTS suspects</td>
<td>referenced sensory and motor cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; Hypesthesia; APB weakness; median compression (Nerve Conduction Studies (NCS))</td>
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<td>CTS Positive (Tinel Sign)</td>
<td>143 clinical CTS suspects</td>
<td>referenced sensory and motor cutoffs</td>
<td>Extremities</td>
<td>index pos; PT; TS; Hypesthesia; APB weakness; median compression (Nerve Conduction Studies (NCS))</td>
<td>index neg; PT; TS; Hypesthesia; APB weakness; median compression (Nerve Conduction Studies (NCS))</td>
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<td>MacDermid,J.C., 1997 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test (Examiner 1))</td>
<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
<td>index neg; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
<td>index neg; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>77</td>
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<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
<td>index neg; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>0.65</td>
<td>0.96</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>MacDermid, J.C., 1997 (1) Moderate Quality</td>
<td>CTS Positive (Semmes-Weinstein Monofilament Test (SWMF) (Examiner 1))</td>
<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>various nerves and compression measurements</td>
<td>Extremities</td>
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<td>various nerves and compression measurements</td>
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<td>Group2 (Reference Standard)</td>
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<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>CTS Positive (Pinch Test (Examiner 2))</td>
<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>CTS Positive (Reverse Phalen Test (Examiner 2))</td>
<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>CTS Positive (Tethered Median Stress Test (TMST) (Examiner 2))</td>
<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
<td>76</td>
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<td>AR</td>
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<td>CTS Positive (Tinel Sign (Examiner 2))</td>
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<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>MacDermid, J.C., 1997 (2)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Vibration Perception; tuning fork; index finger (Examiner 2))</td>
<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
<td>index neg; PT; Vibration; Pinch; RPT; TS; TMST; SWMF (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>77</td>
<td>0.77</td>
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<td>0.72</td>
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<td>Makanji, H.S., 2014</td>
<td>Moderate Quality</td>
<td>CTS Positive (Durkan Test)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>Subjects</td>
<td>index pos; Durkan; PT; Scratch Collapse (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Durkan; PT; Scratch Collapse (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>69</td>
<td>19</td>
<td>0.72</td>
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<td>0.77</td>
<td>0.17</td>
<td>0.93</td>
<td>1.33</td>
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<td>Makanji, H.S., 2014</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>Subjects</td>
<td>index pos; Durkan; PT; Scratch Collapse (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Durkan; PT; Scratch Collapse (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>59</td>
<td>29</td>
<td>0.75</td>
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<td>1.04</td>
<td>0.93</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Scratch Collapse Test)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>Subjects</td>
<td>index pos; Durkan; PT; Scratch Collapse (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Durkan; PT; Scratch Collapse (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Makanji, H.S., 2014</td>
<td>Moderate Quality</td>
<td>CTS Positive (Thenar Atrophy)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; tobacco use (yes); thenar atrophy; thumb abduction weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Gender/Sex F, M; tobacco use (no); thenar atrophy; thumb abduction weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
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<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Makanji,H.S., 2014</td>
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<td>CTS Positive (Thumb Abduction Weakness)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; tobacco use (yes); thenar atrophy; thumb abduction weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>Subjects</td>
<td>index pos; Durkan; PT; Scratch Collapse (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>index neg; Durkan; PT; Scratch Collapse (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Padua,L., 1999</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>clinically suspected idiopathic CTS patients</td>
<td>Extremities</td>
<td>index pos; PT (Nerve Conduction Studies (NCS) and clinical diagnosis; AANEM referenced)</td>
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<td>Raudino,F., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hypoaesthesia; pin prick)</td>
<td>symptomatic and asymptomatic limbs of 83 suspected CTS patients that were NCS confirmed</td>
<td>Extremities</td>
<td>index pos; PT; TS; stress test; hypoesthesia (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Raudino,F., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>symptomatic and asymptomatic limbs of 83 suspected CTS patients that were NCS confirmed</td>
<td>Extremities</td>
<td>index pos; PT; TS; stress test; hypoesthesia (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 N</td>
<td>Group1 PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<tr>
<td>Raudino,F., 2000 Moderate Quality</td>
<td>CTS Positive (Stress Test; hyperextended wrist)</td>
<td>symptomatic and asymptomatic limbs of 83 suspected CTS patients that were NCS confirmed</td>
<td>sensory and motor as compared to control group</td>
<td>Extremities</td>
<td>index pos; PT; TS; stress test; hypoesthesia (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Raudino,F., 2000 Moderate Quality</td>
<td>CTS Positive (Thenar Weakness)</td>
<td>symptomatic and asymptomatic limbs of 83 suspected CTS patients that were NCS confirmed</td>
<td>sensory and motor as compared to control group</td>
<td>Extremities</td>
<td>index pos; thenar weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.96</td>
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<td>Raudino,F., 2000 Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>symptomatic and asymptomatic limbs of 83 suspected CTS patients that were NCS confirmed</td>
<td>sensory and motor as compared to control group</td>
<td>Extremities</td>
<td>index pos; PT; TS; stress test; hypoesthesia (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>63</td>
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<td>0.85</td>
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<td>Weber,R.A., 2000 Moderate Quality</td>
<td>CTS Positive (Pressure Specified Sensory Device (PSSD))</td>
<td>symptomatic and asymptomatic limbs of 83 suspected CTS patients that were NCS confirmed</td>
<td>sensory and motor as compared to control group</td>
<td>Extremities</td>
<td>index pos; PSSD (Clinical Diagnosis)</td>
<td>39</td>
<td>0.73</td>
<td>0.87</td>
<td>0.91</td>
<td>0.65</td>
<td>2.62</td>
<td>0.14</td>
<td>WEAK</td>
<td>MODERATE</td>
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<tr>
<td>Witt,J.C., 2004 Moderate Quality</td>
<td>CTS Positive (Phalen Test)</td>
<td>referred CTS suspects</td>
<td>various NCS parameters as needed</td>
<td>Subjects</td>
<td>index pos; PT; TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.66</td>
<td>0.46</td>
<td>0.42</td>
<td>0.79</td>
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<td>POOR</td>
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<tr>
<td>Witt,J.C., 2004 Moderate Quality</td>
<td>CTS Positive (Tinel Sign)</td>
<td>referred CTS suspects</td>
<td>various NCS parameters as needed</td>
<td>Subjects</td>
<td>index pos; PT; TS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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### TABLE 10: LOW QUALITY STUDIES- PICO 1 (PHYSICAL TESTS VERSUS REFERENCE STANDARD)

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<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes Reported By</th>
<th>Group1 (Reference Standard)</th>
<th>Group2 (Reference Standard)</th>
<th>PPV</th>
<th>NPV</th>
<th>Sens</th>
<th>Spec</th>
<th>LR+</th>
<th>LR-</th>
<th>Rule In Test</th>
<th>Rule Out Test</th>
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<td>CTS Positive (Phalen Test and Tinel Sign)</td>
<td>ALL PREGNANT WOMEN</td>
<td>median to ulnar cutoffs referenced</td>
<td>Subjects</td>
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META-ANALYSES

FIGURE 1: GENERAL EDS VERSUS PHALEN TEST AND TINEL SIGN

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<th>Summary point</th>
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<td>.0226824</td>
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<tr>
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Covariance between estimates of E(logitSe) & E(logitSp) = -.1569019

Log likelihood = -56.726103  Number of studies =

|                   | Coef. | Std. Err. | z   | P>|z| | 95% Conf. Int. |
|-------------------|-------|-----------|-----|------|----------------|
|                  |       |           |     |      |                |
| **Bivariate**     |       |           |     |      |                |
| E(logitSe)        | -1.904242 | .4749668  | 2.83563 | .97  |
| E(logitSp)        | 2.644846  | .3662139  | 1.92658 | 3.3  |
| Var(logitSe)      | 1.725536  | .695593   | 2.039226 | 4.7  |
| Var(logitSp)      | 1.102201  | .594671   | 2.075664 | 2.9  |
| Corr(logitSe,Sp)  | -.9883017 | .0732835  |-.999999 | .99  |
|                  |       |           |     |      |                |
| **HSROC**         |       |           |     |      |                |
| Lambda            | 1.255225  | .4344391  | 2.840402 | 2.1  |
| Theta             | -2.336142  | .691338   | 3.132029 | 1.5  |
| Beta              | -.2241145  | .1566844  | -1.430153 | -0.88 |
| s2alpha           | 0.0322659  | .2011262  | 1.60967 | 6.92 |
| s2theta           | 1.371023  | .6772774  | 5.20662 | 3.6  |

HSROC curve
95% confidence region
95% prediction region
FIGURE 2: GENERAL EDS VERSUS PHALEN TEST
**FIGURE 3: GENERAL EDS VERSUS TINEL SIGN**

| Bivariate | Coef. | Std. Err. | z    | P>|z| | [95% Conf. Int] |
|-----------|-------|-----------|------|------|----------------|
| E(logitSe)| -.9110982 | .2160646 | | | | -.1334577 | -.4877 |
| E(logitSp)| 1.559556  | .1706321 | | | | 1.224103 | 1.09 |
| Var(logitSe)| .5645056 | .247452 | | | | .3960796 | 1.33 |
| Var(logitSp)| .3324116 | .1495127 | | | | .1376643 | .802 |
| Corr(logits)| -.6888283 | .2052935 | | | | -.9233645 | -.07 |

| HSROC | | | | | | | |
|--------|-------|-----------|------|------|----------------|
| Lambda| .9810407 | .3875646 | | | | .221428 | 1.74 |
| Theta| -1.288639 | .1837007 | | | | -1.640685 | -.928 |
| beta| -2.647881 | .2537217 | -1.04 | 0.297 | | -.7620735 | .232 |
| s2alpha| .2695891 | .1738387 | | | | .076177 | .954 |
| s2theta| .3657665 | .1533225 | | | | .1608568 | .831 |

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<tr>
<th>Summary pt.</th>
<th>Se</th>
<th>Sp</th>
<th>DOR</th>
<th>LR+</th>
<th>LR-</th>
<th>1/LR-</th>
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Log likelihood = -106.74462  Number of studies =

Covariance between estimates of E(logitSe) & E(logitSp) = -.021459

![HSROC curve diagram](image)
FIGURE 4: EDS AANEM VERSUS PHALEN TEST
FIGURE 5: EDS AANEM VERSUS TINEL SIGN

Log likelihood = -67.652379
Number of studies = 

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<th>Logit Sp</th>
<th>Var(logit Se)</th>
<th>Var(logit Sp)</th>
<th>Corr(logit Se, logit Sp)</th>
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</table>

Bivariate

| Lambda | 0.2733093 |
| Theta   | -0.7506554 |
| Beta    | 0.1130548 |
| z alpha | 0.3431506 |
| z theta | 0.4954134 |

Summary pt.

| Se      | 0.3588738 |
| Sp      | 0.7188799 |
| DOR    | 1.431405 |
| LR+    | 1.276585 |
| LR-    | 0.8918406 |
| 1/LR-  | 1.121277 |

Covariance between estimates of E(logit Se) & E(logit Sp) = -0.0457227

Confidence region

- Study estimate
- Summary point
- HSROC curve
- 95% confidence region
- 95% prediction region
FIGURE 6: EDS AANEM VERSUS THENAR ATROPHY

Log likelihood = -19.192495
Number of studies

|                | Coef.  | Std. Err. | z     | P>|z|  | [95% Conf.]
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</tbody>
</table>

Covariance between estimates of E(logitSe) & E(logitSp) = -.1641416
HISTORY INTERVIEW GUIDELINE RECOMMENDATIONS

A. HISTORY INTERVIEW TOPICS

Moderate evidence supports not using the following as independent history interview topics to diagnose carpal tunnel syndrome, because alone, each has a poor or weak association with ruling-in or ruling-out carpal tunnel syndrome:

- Sex/gender
- Ethnicity
- Bilateral symptoms
- Diabetes mellitus
- Worsening symptoms at night
- Duration of symptoms
- Patient localization of symptoms
- Hand dominance
- Symptomatic limb
- Age
- BMI

Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

Rationale

Two high quality studies (Claes, 2013; Katz, 1990) and several moderate quality studies investigated the relationship between history interview topics and CTS as compared to a reference standard which was the use of either EDS following AANEM criteria or general EDS methods. When examined individually, each of the factors listed above had a poor or weak association with EDS based on the likelihood ratio. Sex/gender data pooled in a meta-analysis, also showed a poor association with electrodiagnostic testing.

Risks and Harms of Implementing this Recommendation

There are no known harms associated with implementing these recommendations.

Future Research

Future studies should evaluate and use standardized language for describing symptoms and their severity. Standardized scales and stand-alone history interview topics should be evaluated against a reference standard.
B. PATIENT REPORTED NUMBNESS AND PAIN

Limited evidence supports that patients who do not report frequent numbness or pain might not have carpal tunnel syndrome.

**Strength of Recommendation: Limited Evidence 🟠🟠🟠🟠**

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

**Rationale**

One moderate quality study (MacDermid, 1997) found a strong or moderate association between CTS and patient reporting of frequent numbness or frequent pain.

**Risks and Harms of Implementing this Recommendation**

There are no known harms associated with implementing these recommendations.

**Future Research**

Future studies should evaluate and use standardized language for describing symptoms and their severity. Standardized scales and stand-alone history interview topics should be evaluated against a reference standard.
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<tr>
<th>Study</th>
<th>Representative Population</th>
<th>Clear Selection Criteria</th>
<th>Detailed Enough to Replicate</th>
<th>Reference Standard Identifies Target Condition</th>
<th>Blinding</th>
<th>Other Bias?</th>
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<td>High Quality</td>
</tr>
<tr>
<td>Witt, J.C., 2004</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Yagci, I., 2010</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Ziswiler, H.R., 2005</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>High Quality</td>
</tr>
</tbody>
</table>
RESULTS
SUMMARY OF DATA FINDINGS

TABLE 12: SUMMARY OF FINDINGS - INDEX TEST VERSUS AANEM REFERENCED EDS

<table>
<thead>
<tr>
<th>LR+</th>
<th>LR-</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In &quot;STRONG&quot; agreement with the reference standard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In &quot;MODERATE&quot; agreement with the reference standard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In &quot;WEAK&quot; agreement with the reference standard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In &quot;POOR&quot; agreement with the reference standard</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender/Sex</th>
<th>High Quality</th>
<th>Moderate Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule IN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule OUT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule IN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rule OUT</td>
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</table>

Table only displays index tests with more than one article of supporting evidence
### Table 13: Summary of Findings - Index Test versus General EDS Methods

<table>
<thead>
<tr>
<th>Index Test</th>
<th>Rule In/Out</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral Symptoms</td>
<td>RULE IN</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>RULE IN</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td>Gender/Sex Female</td>
<td>RULE IN</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td>Gender/Sex Male</td>
<td>RULE IN</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td>Hand Left</td>
<td>RULE IN</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td>Hand Right</td>
<td>RULE IN</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td>Worsening symptoms at night</td>
<td>RULE IN</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td>✧</td>
<td>✧</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Table only displays index tests with more than one article of supporting evidence*

*Authors with parenthetical numbers indicate a change in EDS method/threshold, alternate limbs, or alternate examiner*

*Authors with parenthetical letters indicate a unique study with the same author and year as another study listed in the guideline*
### DETAILED DATA FINDINGS

#### TABLE 14: HIGH QUALITY STUDIES- PICO 2 (HISTORY INTERVIEW TOPICS VERSUS REFERENCE STANDARD)

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes Reported By</th>
<th>Group 1 (Reference Standard)</th>
<th>Group 2 (Reference Standard)</th>
<th>Group2 N</th>
<th>PPV</th>
<th>NPV</th>
<th>Sens</th>
<th>Spec</th>
<th>LR+</th>
<th>LR-</th>
<th>Rule In Test</th>
<th>Rule Out Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Gender/Sex Female)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>121</td>
<td>index neg; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>35</td>
<td>0.79</td>
<td>0.03</td>
<td>0.74</td>
<td>0.04</td>
<td>0.77</td>
<td>6.80</td>
<td>POOR</td>
</tr>
<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Gender/Sex Male)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>35</td>
<td>index neg; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>121</td>
<td>0.97</td>
<td>0.21</td>
<td>0.26</td>
<td>0.96</td>
<td>6.80</td>
<td>0.77</td>
<td>MODERATE</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV(\text{%})</td>
<td>NPV</td>
<td>Sens(\text{%})</td>
<td>Spec</td>
<td>LR(+)</td>
<td>LR(-)</td>
<td>Rule In Test</td>
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</tr>
<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Opponens Pollicis Weakness)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>10</td>
<td>146</td>
<td>0.90</td>
<td>0.17</td>
<td>0.07</td>
<td>0.96</td>
<td>1.80</td>
<td>1.97</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Wrist Left)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>71</td>
<td>85</td>
<td>0.82</td>
<td>0.15</td>
<td>0.45</td>
<td>0.50</td>
<td>0.89</td>
<td>1.11</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Claes,F., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Wrist Right)</td>
<td>clinically diagnosed CTS suspects</td>
<td>at least 2 of 4 abnormal EDS parameters</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; Hand R, L; thenar atrophy; weakness; OP weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>85</td>
<td>71</td>
<td>0.85</td>
<td>0.18</td>
<td>0.55</td>
<td>0.50</td>
<td>1.11</td>
<td>0.89</td>
<td>POOR</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 N</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 N</td>
<td>Group2 (Reference Standard)</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Katz J.N., 1990 (B)</td>
<td>High Quality</td>
<td>CTS Positive (Age; 40+)</td>
<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
<td>index pos; neurologist assessment; age 40+; nocturnal symptoms; bilateral symptoms (Nerve Conduction Studies (NCS))</td>
<td>73</td>
<td>index neg; neurologist assessment; age 40+; nocturnal symptoms; bilateral symptoms (Nerve Conduction Studies (NCS))</td>
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<td>0.76</td>
<td>0.80</td>
<td>0.42</td>
<td>1.38</td>
<td>0.48</td>
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<tr>
<td>Katz J.N., 1990 (B)</td>
<td>High Quality</td>
<td>CTS Positive (Bilateral Symptoms)</td>
<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
<td>index pos; neurologist assessment; age 40+; nocturnal symptoms; bilateral symptoms (Nerve Conduction Studies (NCS))</td>
<td>55</td>
<td>index neg; neurologist assessment; age 40+; nocturnal symptoms; bilateral symptoms (Nerve Conduction Studies (NCS))</td>
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<td>0.49</td>
<td>0.69</td>
<td>0.61</td>
<td>0.58</td>
<td>1.45</td>
<td>0.67</td>
<td>POOR</td>
</tr>
<tr>
<td>Katz J.N., 1990 (B)</td>
<td>High Quality</td>
<td>CTS Positive (Neurologist Assessment; probable or possible)</td>
<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
<td>index pos; neurologist assessment; age 40+; nocturnal symptoms; bilateral symptoms (Nerve Conduction Studies (NCS))</td>
<td>55</td>
<td>index neg; neurologist assessment; age 40+; nocturnal symptoms; bilateral symptoms (Nerve Conduction Studies (NCS))</td>
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<td>0.87</td>
<td>0.84</td>
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<td>3.08</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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</tr>
<tr>
<td>Katz, J.N., 1990 (B)</td>
<td>High Quality</td>
<td>CTS Positive (Nocturnal Symptoms)</td>
<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
<td>index pos; neurologist assessment; age 40+; nocturnal symptoms; bilateral symptoms (Nerve Conduction Studies (NCS))</td>
<td>81</td>
<td>index neg; neurologist assessment; age 40+; nocturnal symptoms; bilateral symptoms (Nerve Conduction Studies (NCS))</td>
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<td>0.66</td>
<td>0.77</td>
<td>0.29</td>
<td>1.09</td>
<td>0.79</td>
<td>POOR</td>
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<td>Ntani, G., 2013</td>
<td>High Quality</td>
<td>CTS Positive (Pain; hand)</td>
<td>responders from all suspected CTS out-patients</td>
<td>SNC abnormality</td>
<td>Extremities</td>
<td>index pos; thenar weakness; pain (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC))</td>
<td>893</td>
<td>index neg; thenar weakness; pain (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC))</td>
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<td>0.53</td>
<td>0.69</td>
<td>1.69</td>
<td>0.69</td>
<td>POOR</td>
</tr>
<tr>
<td>Tan, S.V., 2012</td>
<td>Moderate Quality</td>
<td>CTS Positive (Clinical symptoms)</td>
<td>limbs of 100 CTS suspects</td>
<td>at least 2 abnormal EDS parameters</td>
<td>Extremities</td>
<td>index pos; clinical symptoms (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>index neg; clinical symptoms (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.73</td>
<td>0.89</td>
<td>0.29</td>
<td>1.25</td>
<td>0.39</td>
<td>POOR</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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</tr>
<tr>
<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Age; 45+)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>40</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>42</td>
<td>0.45</td>
<td>0.76</td>
<td>0.64</td>
<td>0.59</td>
<td>1.58</td>
<td>0.60</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Behavior of symptoms is constant)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>70</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>12</td>
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<td>0.50</td>
<td>0.79</td>
<td>0.11</td>
<td>0.88</td>
<td>1.93</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Behavior of symptoms is intermittent, variable)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>12</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>70</td>
<td>0.50</td>
<td>0.69</td>
<td>0.21</td>
<td>0.89</td>
<td>1.93</td>
<td>0.88</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>Group 1 N</td>
<td>Group 2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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</tr>
<tr>
<td>Wainner,R.S., 2005</td>
<td>High</td>
<td>CTS Positive</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>57</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>25</td>
<td>0.35</td>
<td>0.68</td>
<td>0.71</td>
<td>0.31</td>
<td>1.04</td>
<td>0.91</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Wainner,R.S., 2005</td>
<td>High</td>
<td>CTS Positive</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>56</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>26</td>
<td>0.39</td>
<td>0.77</td>
<td>0.79</td>
<td>0.37</td>
<td>1.25</td>
<td>0.58</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Wainner,R.S., 2005</td>
<td>High</td>
<td>CTS Positive</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>22</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>60</td>
<td>0.50</td>
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<td>Threshold Notes</td>
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<td>Group 2 (Reference Standard)</td>
<td>Group 1 N</td>
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<td>NPV</td>
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<td>Spec</td>
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<td>LR-</td>
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<td>High Quality</td>
<td>CTS Positive (Hand feels fat or swollen)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>CTS Positive (Loss of feeling is the most bothersome symptom)</td>
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<td>Subjects</td>
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<td>Rule In Test</td>
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<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
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<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Subjects</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Group2 (Reference Standard)</td>
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<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>High Quality</td>
<td>CTS Positive (Hand Left)</td>
<td>71 CTS suspects referred to outpatient clinic in Switzerland</td>
<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
<td>index pos; Hand RIGHT, Hand LEFT (Nerve Conduction Studies (NCS); AANEM referenced and Rated Signs and Symptoms)</td>
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<td>71 CTS suspects referred to outpatient clinic in Switzerland</td>
<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
<td>index pos; Hand RIGHT, Hand LEFT (Nerve Conduction Studies (NCS); AANEM referenced and Rated Signs and Symptoms)</td>
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<td>index neg; Hand RIGHT, Hand LEFT (Nerve Conduction Studies (NCS); AANEM referenced and Rated Signs and Symptoms)</td>
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### TABLE 15: MODERATE QUALITY STUDIES- PICO 2 (HISTORY INTERVIEW TOPICS VERSUS REFERENCE STANDARD)

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
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<th>Patient Characteristics</th>
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<th>Outcomes Reported By</th>
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<th>Group 2 (Reference Standard)</th>
<th>Outcome Rule In Test</th>
<th>Rule Out Test</th>
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<td>Becker,J., 2002</td>
<td>Moderate Quality</td>
<td>CTS Positive (Age; 41-60)</td>
<td>CTS symptomatic subjects referred for NCS and EMG from 5 Brazil facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; BMI; Age; Diabetes (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; Gender/Sex F, M; BMI; Age; Diabetes (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
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<td>CTS Positive (BMI; &gt;30)</td>
<td>CTS symptomatic subjects referred for NCS and EMG from 5 Brazil facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; BMI; Age; Diabetes (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
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<td>CTS Positive (Diabetes Mellitus)</td>
<td>CTS symptomatic subjects referred for NCS and EMG from 5 Brazil facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Subjects</td>
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<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
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<td>CTS symptomatic subjects referred for NCS and EMG from 5 Brazil facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Subjects indexed pos; Gender/Sex F, M; BMI; Age; Diabetes (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
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<td>CTS Positive (Gender/Sex Male)</td>
<td>CTS symptomatic subjects referred for NCS and EMG from 5 Brazil facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Subjects indexed pos; Gender/Sex F, M; BMI; Age; Diabetes (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
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<td>CTS Positive (Does a splint relieve symptoms)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities indexed pos; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
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<td>Group1 (Reference Standard)</td>
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<td>CTS Positive (Duration of Symptoms 0-3 months)</td>
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<td>index pos; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
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<td>sensory and motor latency cutoffs</td>
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<td>Patient Characteristics</td>
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<td>CTS Positive (Duration of Symptoms 6-12 months)</td>
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<td>CTS Positive (Hand Left or Ambidextrous)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
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<td>CTS Positive (Hand Right)</td>
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<td>CTS Positive (Symptoms equal in both hands)</td>
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<td>sensory and motor latency cutoffs</td>
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<td>Outcomes Reported By</td>
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<td>sensory and motor latency cutoffs</td>
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<td>CTS Positive (Symptoms worse in Right Hand)</td>
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<td>sensory and motor latency cutoffs</td>
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<td>index pos; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
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<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>715</td>
<td>index neg; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>7508</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV N PV</td>
<td>Sens Spec</td>
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<tr>
<td>Bland,J.D., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Worse symptoms in all fingers including the thumb)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>index neg; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>5629</td>
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<td>Bland,J.D., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Worse symptoms in middle and ring)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>index neg; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>7514</td>
<td>0.65</td>
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<td>Bland,J.D., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Worse symptoms in ring and pinky)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>index neg; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV/NPV</td>
<td>LR+ LR-</td>
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<td>Bland J.D., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Worse symptoms in thumb, index, and middle)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos: Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>index neg: Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>3088</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Worsening symptoms at night)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos: Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>index neg: Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>5717</td>
<td>2506</td>
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<td>Bland J.D., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Worsening symptoms during hand work)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos: Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>index neg: Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>6267</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Groupp1 N</td>
<td>Groupp2 N</td>
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<td>Bland,J.D., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Worsening symptoms first thing in the morning)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>index neg; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>5465</td>
<td>2758</td>
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<tr>
<td>Bland,J.D., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Worsening symptoms while driving)</td>
<td>7768 East Kent referrals to NCS lab for suspected CTS</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>index neg; Gender/Sex F, M; Hand R, L/A; symptoms; history; fingers; duration; Gender/Sex (Nerve Conduction Studies (NCS))</td>
<td>3024</td>
<td>5199</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (&lt;6 months since free of numbness, tingling, or pain in the hands for 4+ weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>325</td>
<td>520</td>
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<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (&lt;7 days in the past 4 weeks when numbness, tingling, or pain in the hands disturbed sleep)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>166</td>
<td>659</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (&lt;7 days in the past 4 weeks when numbness, tingling, or pain in the hands)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>49</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (0 days in the past 4 weeks when numbness, tingling, or pain in the hands disturbed sleep)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>157</td>
<td>668</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (0 somatic symptoms at least moderately distressing in the past week)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>223</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Grou p2 N</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (1 somatic symptom at least moderately distressing in the past week)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>233</td>
<td>651</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (1+ years since free of numbness, tingling, or pain in the hands for 4+ weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>450</td>
<td>395</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (14-28 days in the past 4 weeks when numbness, tingling, or pain in the hands disturbed sleep)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>341</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (14-28 days in the past 4 weeks with numbness, tingling, or pain in the hands)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>631</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (2+ somatic symptoms at least moderately distressing in the past week)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>428</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (6+ months to &lt;1 year since free of numbness, tingling, or pain in the hands for 4+ weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>70</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (7-13 days in the past 4 weeks when numbness, tingling, or pain in the hands disturbed sleep)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>161</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (7-13 days in the past 4 weeks with numbness, tingling, or pain in the hands)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>102</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Groupl N</td>
<td>Groupl PPV/N PV</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Age; 20-29)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>55</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Age; 30-39)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>172</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Age; 40-49)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Age; 50-59)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>281</td>
<td>0.53</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Age; 60+)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td></td>
<td>95</td>
<td>789</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Being very clumsy due to hand symptoms in the past 4 weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
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<td>106</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (BMI; &lt;25)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; symptoms (Nerve Conduction Studies (NCS))</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (BMI; 25+ but &lt;30)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; symptoms (Nerve Conduction Studies (NCS))</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Grou p2 N</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (BMI; 30+)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; symptoms (Nerve Conduction Studies (NCS))</td>
<td>277</td>
<td>585</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Current smoker)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>184</td>
<td>693</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Diabetes Mellitus)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>55</td>
<td>829</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Difficulty fastening buttons or zips due to hand symptoms in the past 4 weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>111</td>
<td>773</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Difficulty turning taps, using kitchen gadgets, sewing, or doing repairs due to hand symptoms in the past 4 weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>196</td>
<td>688</td>
<td>0.54</td>
</tr>
<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ethnicity; Other)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>26</td>
<td>858</td>
<td>0.73</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ethnicity; South Asian)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>32</td>
<td>852</td>
<td>0.75</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ethnicity; White)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>826</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ex-smoker)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>233</td>
<td>644</td>
<td>0.58</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Gender/Sex Female)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>594</td>
<td>290</td>
<td>0.54</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Gender/Sex Male)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>290</td>
<td>594</td>
<td>0.53</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Having minor accidents (e.g. dropping things) due to hand symptoms in the past 4 weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>120</td>
<td>764</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate</td>
<td>CTS Positive (Job dissatisfaction )</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>121</td>
<td>763</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate</td>
<td>CTS Positive (Lifting/carrying weights 5+ kg in one hand in a working day)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>355</td>
<td>529</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate</td>
<td>CTS Positive (Little choice in how or what work is done or in timetable and breaks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>212</td>
<td>672</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate</td>
<td>CTS Positive (Little support from supervisor or colleagues)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Mental Health; Good)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>324</td>
<td>556</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Mental Health; Intermediate)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>297</td>
<td>583</td>
<td>0.52</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Mental Health; Poor)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>256</td>
<td>624</td>
<td>0.58</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Never smoked)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>460</td>
<td>417</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Grou p2 N</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Other Arthritis)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>184</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Other repeated movements of wrist/fingers for &gt;4 hours per working day)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
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<td>435</td>
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<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Pain in the elbow in the past 4 weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; symptoms (Nerve Conduction Studies (NCS))</td>
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<td>533</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Pain in the neck in the past 4 weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; symptoms (Nerve Conduction Studies (NCS))</td>
<td>439</td>
<td>445</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>LRR</td>
<td>Rule In Test</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Pain in the shoulder in the past 4 weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; symptoms (Nerve Conduction Studies (NCS))</td>
<td>431</td>
<td>453</td>
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<td>0.62</td>
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<td>1.01</td>
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</table>

| Coggon,D., 2013 | Moderate Quality | CTS Positive (Repeated bending/straightening of elbow for >1 hour per working day) | CTS suspected adults from one hosp referred to neurophysiology | sensory nerve conduction in index and between index and pinky >8ms | Subjects | index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS)) | index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS)) | 337 | 453 | 0.50|0.4  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.45|0.4  | 0.85|1.  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.62|0.8  | 0.52|0.9  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.05|0.9  | 1.04|1.  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.99|1.01 | POOR|      |

| Coggon,D., 2013 | Moderate Quality | CTS Positive (Rheumatoid Arthritis) | CTS suspected adults from one hosp referred to neurophysiology | sensory nerve conduction in index and between index and pinky >8ms | Subjects | index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS)) | index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS)) | 842 | 453 | 0.50|0.4  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.45|0.4  | 0.85|1.  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.62|0.8  | 0.52|0.9  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.05|0.9  | 1.04|1.  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 1.04|1.00 | POOR|      |

<p>| Coggon,D., 2013 | Moderate Quality | CTS Positive (Targets, bonuses, or deadlines provided by work) | CTS suspected adults from one hosp referred to neurophysiology | sensory nerve conduction in index and between index and pinky &gt;8ms | Subjects | index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS)) | index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS)) | 430 | 453 | 0.50|0.4  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.45|0.4  | 0.85|1.  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.52|0.9  | 1.03|0.9  |
|                 |         |                                                            |                                                               |                                          |                      |                             |                             | 0.97|  | POOR|      |</p>
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes Reported By</th>
<th>Group 1 (Reference Standard)</th>
<th>Group 2 (Reference Standard)</th>
<th>Group 1 N</th>
<th>Group 2 N</th>
<th>PPV</th>
<th>NPV</th>
<th>Sens</th>
<th>Spec</th>
<th>LR+</th>
<th>LR-</th>
<th>Rule In Test</th>
<th>Rule Out Test</th>
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<tbody>
<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Trouble writing or typing due to hand symptoms in the past 4 weeks)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>index neg; demographics and symptoms (Nerve Conduction Studies (NCS))</td>
<td>132</td>
<td>752</td>
<td>0.53</td>
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<td>POOR</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Use of keyboard or mouse for &gt;4 hours per working day)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>265</td>
<td>619</td>
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<td>0.6</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Work for &gt;1 hour per working day with tools that made the hands/arms vibrate)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>129</td>
<td>755</td>
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<td>0.4</td>
<td>0.16</td>
<td>0.8</td>
<td>1.28</td>
<td>0.96</td>
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<tr>
<td>Coggon,D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Work with hand above shoulder height for &gt;1 hour per working day)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms</td>
<td>Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>Group 1 N</td>
<td>Group 2 N</td>
<td>PPV/NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>Coggon, D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Work with neck bent forward for &gt;2 hours per working day)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>369</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>515</td>
<td>0.52</td>
<td>0.45</td>
<td>0.41</td>
<td>0.57</td>
<td>0.94</td>
<td>1.04</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Coggon, D., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Work with neck twisted for &gt;0.05 hours per working day)</td>
<td>CTS suspected adults from one hosp referred to neurophysiology</td>
<td>sensory nerve conduction in index and between index and pinky &gt;8ms Subjects</td>
<td>index pos; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
<td>226</td>
<td>index neg; occupational and non-occupational factors (Nerve Conduction Studies (NCS))</td>
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<td>0.55</td>
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<td>0.26</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Hand Left)</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs Extremities</td>
<td>index pos; Hand RIGHT, Hand LEFT (Nerve Conduction Studies (NCS))</td>
<td>1108</td>
<td>index neg; Hand RIGHT, Hand LEFT (Nerve Conduction Studies (NCS))</td>
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<td>sensory, motor, and MUDS cutoffs Extremities</td>
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<td>Patient Characteristics</td>
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<td>Outcomes Reported By</td>
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<td>Grou p1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR−</td>
<td>Rule In Test</td>
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<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; Hand RIGHT, Hand LEFT (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
<td>1108</td>
<td>index neg; Hand RIGHT, Hand LEFT (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
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<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; Hand RIGHT, Hand LEFT (Nerve Conduction Studies (NCS) and Katz Hand Diagram; classic or probable)</td>
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<td>El,Miedany Y., 2008</td>
<td>Moderate Quality</td>
<td>CTS Positive (Tenosynovitis )</td>
<td>clinically diagnosed CTS suspects; large tenosynovitis prevalence</td>
<td>tenosynovitis diagnosed with US; CTS by NCS abnormalities in sensory, motor, or comparative</td>
<td>Subjects</td>
<td>index pos; tenosynovitis (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>119</td>
<td>index neg; tenosynovitis (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.68</td>
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<td>0.2</td>
<td>0.56</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Grou p1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Franzblau,A., 1994 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Distal extremity symptoms and nocturnal symptoms)</td>
<td>408 at risk workers from various facilities</td>
<td>median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms</td>
<td>Extremities</td>
<td>index pos; Handed dom, non-dom; distal and nocturnal sympt (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
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<td>index neg; Handed dom, non-dom; distal and nocturnal sympt (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Dominant Hand)</td>
<td>408 at risk workers from various facilities</td>
<td>median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms</td>
<td>Extremities</td>
<td>index pos; Handed dom, non-dom; distal and nocturnal sympt (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
<td>408</td>
<td>index neg; Handed dom, non-dom; distal and nocturnal sympt (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
<td>408</td>
<td>0.20</td>
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<td>CTS Positive (Non-Dominant Hand)</td>
<td>408 at risk workers from various facilities</td>
<td>median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms</td>
<td>Extremities</td>
<td>index pos; Handed dom, non-dom; distal and nocturnal sympt (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
<td>408</td>
<td>index neg; Handed dom, non-dom; distal and nocturnal sympt (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
<td>408</td>
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<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Groupl N</td>
<td>Group2 (Reference Standard)</td>
<td>Groupl N</td>
<td>PPV</td>
<td>N PV</td>
<td>Sens</td>
<td>Specificity</td>
<td>LR+</td>
<td>L R-</td>
<td>Rule In Test</td>
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<td>CTS Positive (Distal extremity symptoms and nocturnal symptoms)</td>
<td>408 at risk workers from various facilities</td>
<td>median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms</td>
<td>Extremities</td>
<td>index pos; Handed dom, non-dom; distal and nocturnal symp (Nerve Conduction Studies (NCS); &gt;.8ms)</td>
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<td>index neg; Handed dom, non-dom; distal and nocturnal symp (Nerve Conduction Studies (NCS); &gt;.8ms)</td>
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<td>Franzblau, A. , 1994 (2)</td>
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<td>408 at risk workers from various facilities</td>
<td>median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms</td>
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<td>408 at risk workers from various facilities</td>
<td>median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>PPV/NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<tr>
<td>Gomes, I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Age; 40-60)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI&gt;30; Age 40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.5</td>
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<td>0.74</td>
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<td>Gomes, I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (BMI; 30+)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI&gt;30; Age 40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.30</td>
<td>0.8</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>N</td>
<td>PV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Gender/Sex Female)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>2948</td>
<td>959</td>
<td>0.44</td>
<td>0.7</td>
<td>0.85</td>
<td>0.3</td>
<td>1.23</td>
<td>0.48</td>
<td>POOR</td>
<td>WEAK</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Gender/Sex Male)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory sympt; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>959</td>
<td>2948</td>
<td>0.23</td>
<td>0.5</td>
<td>0.15</td>
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<td>0.48</td>
<td>1.23</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<tr>
<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Pain; upper limb)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory symp; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>3092</td>
<td>index neg; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory symp; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.42</td>
<td>0.71</td>
<td>0.85</td>
<td>0.24</td>
<td>1.12</td>
<td>0.63</td>
<td>POOR</td>
<td>WEAK</td>
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<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Paresthesia; upper limb)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI30+; Age40-60; Paresthesia; Pain; Sensory symp; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.37</td>
<td>POOR</td>
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<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
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<tr>
<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Sensory Symptoms; hand)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI≥30; Age≥40-60; Paresthesia; Pain; Sensory symp; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Gender/Sex F, M; BMI≥30; Age≥40-60; Paresthesia; Pain; Sensory symp; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>3161</td>
<td>746</td>
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<td>0.83</td>
<td>0.92</td>
<td>0.26</td>
<td>6</td>
<td>1.24</td>
<td>0.32</td>
<td>POOR</td>
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<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Worsening symptoms at night)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; Gender/Sex F, M; BMI≥30; Age≥40-60; Paresthesia; Pain; Sensory symp; weak; night; atrophy (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>1981</td>
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<td>0.56</td>
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<td>Katz,J.N., 1991</td>
<td>Moderate Quality</td>
<td>CTS Positive (Occupation; exposed to pinching, grasping, wrist flexion, or vibration)</td>
<td>CTS symptomatic subjects at one hospital</td>
<td>referenced motor and sensory latency cutoffs</td>
<td>Subjects</td>
<td>index pos; Occupation (Nerve Conduction Studies (NCS))</td>
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<td>Reference Title</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
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<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Grou p2 N</td>
<td>PPV</td>
<td>N PV</td>
<td>Sens</td>
<td>S pec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>CTS Positive (Employment; Disability)</td>
<td>charts of all patients suspected of CTS referred to outpatient EDS lab</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Subjects</td>
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<td>index neg; employment; referral source (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Subjects</td>
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<td>index neg; employment; referral source (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.50</td>
<td>0.80</td>
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<td>0.71</td>
<td>1.04</td>
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<td>charts of all patients suspected of CTS referred to outpatient EDS lab</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Subjects</td>
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<td>Group2 (Reference Standard)</td>
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<td>Spec</td>
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<td>LR-</td>
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<td>Rule Out Test</td>
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<td>Lo,J.K., 2002</td>
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<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Subjects</td>
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<td>Lo,J.K., 2002</td>
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<td>charts of all patients suspected of CTS referred to outpatient EDS lab</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Subjects</td>
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<td>0.53</td>
<td>1.01</td>
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<td>Subjects</td>
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<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Group2 (Reference Standard)</td>
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<td>N PV</td>
<td>Sens</td>
<td>S pec</td>
<td>LR+</td>
<td>L R-</td>
<td>Rule In Test</td>
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<td>0.5 1</td>
<td>0.00</td>
<td>0.9 8</td>
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<td>0.20</td>
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<td>Patient Characteristics</td>
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<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>PPV</td>
<td>N</td>
<td>PV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>0.5 2</td>
<td>0.04</td>
<td>0.9 8</td>
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<td>0. 99</td>
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<td>MacDermid, J.C., 1997</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hand Symptoms Only)</td>
<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; numb; pain; night symp; hand only (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>0.4 4</td>
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<td>MacDermid, J.C., 1997</td>
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<td>CTS Positive (Numbness; frequent)</td>
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<td>various nerves and compression measurements</td>
<td>Extremities</td>
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<td>Outcomes Reported By</td>
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<td>Group 2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Grou p2 N</td>
<td>PPV/NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>MacDermid, J.C., 1997</td>
<td>Moderate Quality</td>
<td>CTS Positive (Pain; frequent)</td>
<td>referred to clinic for CTS symptoms</td>
<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; numb; pain; night sympt; hand only (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>index neg; numb; pain; night sympt; hand only (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>0.49</td>
<td>0.92</td>
<td>0.97</td>
<td>0.25</td>
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<td>MacDermid, J.C., 1997</td>
<td>Moderate Quality</td>
<td>CTS Positive (Worsening symptoms at night)</td>
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<td>various nerves and compression measurements</td>
<td>Extremities</td>
<td>index pos; numb; pain; night sympt; hand only (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>index neg; numb; pain; night sympt; hand only (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)</td>
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<td>0.69</td>
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<td>Makanji,H.S., 2014</td>
<td>Moderate Quality</td>
<td>CTS Positive (Gender/Sex Female)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>Subjects</td>
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<td>0.58</td>
<td>0.26</td>
<td>0.79</td>
<td>0.59</td>
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MacDermid, J.C., 1997

Moderate Quality

CTS Positive (Pain; frequent)

referred to clinic for CTS symptoms

various nerves and compression measurements

Extremities

index pos; numb; pain; night sympt; hand only (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)

71

index neg; numb; pain; night sympt; hand only (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)

13

0.49|0.92

0.97|0.25

1.30|0.11

POOR

MODERATE

MacDermid, J.C., 1997

Moderate Quality

CTS Positive (Pain; frequent)

referred to clinic for CTS symptoms

various nerves and compression measurements

Extremities

index pos; numb; pain; night sympt; hand only (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)

39

index neg; numb; pain; night sympt; hand only (Nerve Conduction Studies (NCS), Electromyography (EMG), and Clinical Diagnosis)

45

0.69|0.80

0.75|0.75

3.00|0.33

WEAK

WEAK

Makanji,H.S., 2014

Moderate Quality

CTS Positive (Gender/Sex Female)

referred CTS suspects

DML and DSL with referenced normal values

Subjects

index pos; Gender/Sex F, M; tobacco use (yes); thenar atrophy; thumb abduction weakness (Nerve Conduction Studies (NCS); AANEM referenced)

55

index neg; Gender/Sex F, M; tobacco use (no); thenar atrophy; thumb abduction weakness (Nerve Conduction Studies (NCS); AANEM referenced)

33

0.69|0.18

0.58|0.26

0.79|0.59

POOR

POOR
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes Reported By</th>
<th>Group 1 (Reference Standard)</th>
<th>Group 2 (Reference Standard)</th>
<th>Rule In Test</th>
<th>Rule Out Test</th>
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<tr>
<td>Makanji,H.S., 2014</td>
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<td>CTS Positive (Gender/Sex Male)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>Subjects</td>
<td>index pos; Gender/Sex F, M; tobacco use (yes); thenar atrophy; thumb abduction weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; Gender/Sex F, M; tobacco use (no); thenar atrophy; thumb abduction weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Makanji,H.S., 2014</td>
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<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>Subjects</td>
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<td>index neg; Gender/Sex F, M; tobacco use (no); thenar atrophy; thumb abduction weakness (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Pastare,D., 2009</td>
<td>Moderate</td>
<td>CTS Positive (Clinical Diagnosis; 2 or more symptoms)</td>
<td>66 CTS suspected patients referred to Neuro lab in Singapore hosp</td>
<td>sensory, motor, and LINT cutoffs</td>
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### Table 16: Low Quality Studies - PICO 2 (History Interview Topics Versus Reference Standard)

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<th>NP V</th>
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<th>L R-</th>
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<tr>
<td>Glowacki, K. A., 1996</td>
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<td>167 clinically diagnosed CTS surgical patients</td>
<td>motor and sensory latency cutoff values</td>
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META-ANALYSES

FIGURE 7: EDS AANEM VERSUS FEMALE GENDER/SEX

Study estimate
Summary point
HSROC curve
95% confidence region
95% prediction region
FIGURE 8: EDS AANEM VERSUS MALE GENDER/SEX

|                     | Coef. | Std. Err. | z    | P>|z| | [95% Conf. |
|---------------------|-------|-----------|------|-----|----------|
| Bivariate           |       |           |      |     |          |
| E(logitSe)          | -.8485846 | .3608612 | -1.55586 |
| E(logitSp)          | .6914602 | .9139788 | -1.099905 |
| Var(logitSe)        | .4442555 | .3623158 | .0898306 |
| Var(logitSp)        | 3.015886 | 2.550002 | .5750278 |
| Corr(logits)        | -.497311 | .4296461 | -.9308227 |
| HSROC               |       |           |      |     |          |
| Lambda              | -.9413714 | .7981676 | -2.505751 |
| Theta               | -.8990592 | .5154313 | -1.909286 |
| beta                | .9576201 | .5343636 | 1.79 | 0.073 | -.0897132 |
| Z2alpha             | 1.163722 | .9701401 | .2271136 |
| Z2theta             | .8665668 | .6902973 | .1818631 |
| Summary pt.         |       |           |      |     |          |
| Se                  | .2997299 | .0757418 | .1742416 |
| Sp                  | .6662917 | .2032205 | .2497576 |
| DOR                 | .8545978 | .7017943 | .1709057 |
| LR+                 | .8981792 | .490997 | .3076427 |
| LR-                 | 1.050996 | .2889716 | .6131451 |
| 1/LR-               | .9514781 | .261609 | .5550867 |

Covariance between estimates of E(logitSe) & E(logitSp) = -.1456056
IMAGING GUIDELINE RECOMMENDATIONS

A. HAND-HELD NERVE CONDUCTION STUDY (NCS)
Limited evidence supports that a hand-held nerve conduction study (NCS) device might be used for the diagnosis of carpal tunnel syndrome.

Strength of Recommendation: Limited Evidence ★★★★

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

Rationale
There was one moderate quality study (Tan, 2012) evaluating the use of a hand-held NCS device for the diagnosis of CTS. This study showed that a handheld NCS device can rule in or rule out the diagnosis of CTS, in patients with typical symptoms of CTS, using EDS following AANEM criteria as the reference standard. The hand-held NCS device closely parallels the severity of disease compared with the neurological assessment as well.

Risks and Harms of Implementing this Recommendation
The user should be aware of the limitations and specific utility of these devices. They should not be used in patients that have symptoms or signs that might suggest an alternative diagnosis or in patients who have weakness or atrophy. Use of the hand-held NCS device in those with alternative diagnosis to CTS or motor deficit may result in missed or delayed diagnosis.

Future Research
More high quality studies are needed to confirm the utility of this method in comparisoned to electrodiagnostic studies.

B. MRI
Moderate evidence supports not routinely using MRI for the diagnosis of carpal tunnel syndrome.

Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

Rationale
There was one high quality study (Jarvik, 2002) evaluating MRI for the diagnosis of CTS. Findings on MRI had a weak or poor association as a rule out test for CTS as compared to a classic or probable hand pain diagram and nerve conduction study. Only severe fascicular swelling, severe flexor tenosynovitis, or severe increased muscle signal had a strong association with CTS, suggesting that MRI would be insensitive in identifying the diagnosis of CTS in the majority of patients in whom these findings would be unlikely to be present.
Risks and Harms of Implementing this Recommendation
There are no known harms associated with implementing these recommendations.

Future Research
In order for imaging modalities to be effective in diagnosis of CTS consensus on the optimal location for the measurements and threshold values for parameters such as cross-sectional area are required.

C. DIAGNOSTIC ULTRASOUND
Limited evidence supports not routinely using ultrasound for the diagnosis of carpal tunnel syndrome.

Strength of Recommendation: Limited Evidence ★★★★

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

Rationale
There were five high quality (Naranjo, 2007; Moran, 2009; Ziswiler, 2005; Wong, 2004; Claes, 2013) and seven moderate quality studies (Abdel Ghaffar, 2012; Dejaco, 2013; Fowler, 2014; Hashemi, 2009; Moghtaderi, 2012; Nakamichi, 2002; Pastare, 2009) evaluating ultrasound for the diagnosis of CTS compared with EDS as the reference standard. These studies showed conflicting results regarding the utility of ultrasound (US) as either a rule in or rule out test in the diagnosis of CTS. In general, there was variation between the studies for the cut-off value for making the diagnosis or for exclusion of CTS. The ideal location for measuring the cross-sectional area (CSA) of the median nerve for indicating the diagnosis of CTS also varied between studies. There is a general agreement that a CSA greater than 12-13 mm is strongly correlated with EDS. As a rule out study for CTS, there is a strong correlation with CSA below 8 mm. One moderate quality (Abdel Ghaffar, 2012) and one low quality study (Mallouhi, 2006) suggest that a US measurement of nerve hypervascularity may have a strong association as a rule out study for CTS.

Risks and Harms of Implementing this Recommendation
There are no known harms associated with implementing these recommendations.

Future Research
In order for imaging modalities to be effective in diagnosis of CTS consensus on the optimal location for the measurements and threshold values for parameters such as cross-sectional area are required. Further high quality studies are needed to determine the utility of hypervascularity of the median nerve by ultrasound in the diagnosis of CTS.
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<td>●</td>
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<td>Moderate Quality</td>
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<td>Werner, R.A., 1994</td>
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<td>Yazdchi, M., 2012</td>
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<td>●</td>
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<td>Moderate Quality</td>
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<tr>
<td>Study</td>
<td>Representative Population</td>
<td>Clear Selection Criteria</td>
<td>Detailed Enough to Replicate</td>
<td>Reference Standard Identifies Target Condition</td>
<td>Blinding</td>
<td>Other Bias?</td>
<td>Inclusion</td>
<td>Strength</td>
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<td>Ziswiler, H.R., 2005</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<td>✔</td>
<td>✔</td>
<td>Include</td>
<td>High Quality</td>
</tr>
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</table>
RESULTS

SUMMARY OF DATA FINDINGS

TABLE 18: SUMMARY OF FINDINGS- INDEX TEST VERSUS AANEM REFERENCED EDS

<table>
<thead>
<tr>
<th>LR +</th>
<th>LR -</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>&gt;5 but &lt;10</td>
<td>&gt;0.1 but &lt;0.2</td>
</tr>
<tr>
<td>&gt;2 and &lt;5</td>
<td>&gt;0.2 but &lt;0.5</td>
</tr>
<tr>
<td>&lt;2</td>
<td>&gt;0.5</td>
</tr>
</tbody>
</table>

In "STRONG" agreement with the reference standard
In "MODERATE" agreement with the reference standard
In "WEAK" agreement with the reference standard
In "POOR" agreement with the reference standard

<table>
<thead>
<tr>
<th>Index Test</th>
<th>Rule In/Out</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
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<tbody>
<tr>
<td>Hand held NCS</td>
<td>RULE IN</td>
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<tr>
<td></td>
<td>RULE OUT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultrasound; CSA inlet; &gt;9mm sq</td>
<td>RULE IN</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultrasound; CSA proximal inlet; &gt;10mm sq</td>
<td>RULE IN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Table only displays index tests with more than one article of supporting evidence

Authors with parenthetical numbers indicate a change in EDS method/threshold, alternate limbs, or alternate examiner
### TABLE 19: SUMMARY OF FINDINGS- INDEX TEST VERSUS GENERAL EDS METHODS

<table>
<thead>
<tr>
<th>LR +</th>
<th>LR -</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10</td>
<td>&lt;0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;5 but &lt;10</td>
<td>&gt;0.1 but &lt;0.2</td>
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</tr>
<tr>
<td>&gt;2 and &lt;5</td>
<td>&gt;0.2 but &lt;0.5</td>
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<tr>
<td>≤2</td>
<td>≥0.5</td>
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</tbody>
</table>

Table only displays index tests with more than one article of supporting evidence
**DETAILED DATA FINDINGS**

**TABLE 20: HIGH QUALITY STUDIES- PICO 3 (IMAGING MODALITIES VERSUS REFERENCE STANDARD)**

<p>| Reference Title | Quality | Outcome (Index Test) | Patient Characteristics | Threshold Notes | Outcomes Reported By | Group1 (Reference Standard) | Group2 (Reference Standard) | Group1 N | Group2 N | PPV|NPV | Sens|Spec | LR+|LR- | Rule In Test | Rule Out Test |
|-----------------|---------|----------------------|-------------------------|-----------------|----------------------|-----------------------------|-----------------------------|---------|---------|---------|---------|---------|---------|---------|----------------|----------------|
| Claes,F., 2013  | High Quality | CTS Positive (Ultrasound; CSA inlet) | clinically diagnosed CTS suspects | at least 2 of 4 abnormal EDS parameters | Subjects | index pos; CSA (Nerve Conduction Studies (NCS); AANEM referenced) | index neg; CSA (Nerve Conduction Studies (NCS); AANEM referenced) | 89 | 67 | 0.97|0.34 | 0.66|0.88 | 5.73|0.38 | MODERATE | WEAK |
| Franzblau,A., 1994 (1) | High Quality | CTS Positive (Current Perception Threshold (CPT)) | manufacturing workers in Michigan with complaints of CTS | confirmed median mononeuropathy by NCS only | Subjects | index pos; CPT (Nerve Conduction Studies (NCS); &gt;.5ms) | index neg; CPT (Nerve Conduction Studies (NCS); &gt;.5ms) | 34 | 48 | 0.26|0.88 | 0.60|0.63 | 1.61|0.64 | POOR | POOR |
| Franzblau,A., 1994 (2) | High Quality | CTS Positive (Current Perception Threshold (CPT)) | manufacturing workers in Michigan with complaints of CTS | median to ulnar sensory peak latency of &gt;.5ms | Subjects | index pos; CPT (Nerve Conduction Studies (NCS); &gt;.5ms and Clinical Symptoms) | index neg; CPT (Nerve Conduction Studies (NCS); &gt;.5ms and Clinical Symptoms) | 35 | 48 | 0.11|0.96 | 0.67|0.60 | 1.66|0.56 | POOR | POOR |
| Jarvik,J.G., 2002 | High Quality | CTS Positive (Any MRI abnormality) | CTS suspects from 5 sites in Seattle | median to ulnar sensory peak and mixed nerve latency | Subjects | index pos; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable) | index neg; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable) | . | . | AR | 0.92|0.28 | 1.28|0.29 | POOR | WEAK |</p>
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes Reported By</th>
<th>Group1 (Reference Standard)</th>
<th>Group2 (Reference Standard)</th>
<th>PPV</th>
<th>NPV</th>
<th>Sens</th>
<th>Spec</th>
<th>LR+</th>
<th>LR-</th>
<th>Rule In Test</th>
<th>Rule Out Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jarvik,J.G., 2002</td>
<td>High Quality</td>
<td>CTS Positive (Any severe MRI abnormality)</td>
<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
<td>index pos; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
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<td>.</td>
<td>.</td>
<td>AR</td>
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<td>0.72</td>
<td>2.07</td>
<td>0.58</td>
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<tr>
<td>Jarvik,J.G., 2002</td>
<td>High Quality</td>
<td>CTS Positive (MRI; Bowing of flexor retinaculum)</td>
<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
<td>index pos; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
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<tr>
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<td>CTS Positive (MRI; Deep palmar bursitis)</td>
<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
<td>index pos; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<tr>
<td>Jarvik,J.G., 2002</td>
<td>High Quality</td>
<td>CTS Positive (MRI; Fascicular swelling)</td>
<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
<td>index pos; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
<td>.</td>
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<td>index neg; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
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<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
<td>index pos; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
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<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
<td>index pos; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
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<td>index neg; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
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<td>Group2 (Reference Standard)</td>
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<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>NPV</td>
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<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
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<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
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<td>STRONG</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
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<td>High Quality</td>
<td>CTS Positive (MRI; Severe flexor tenosynovitis)</td>
<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
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<td>1.00</td>
<td>10.00</td>
<td>1.00</td>
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<td>POOR</td>
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<td>High Quality</td>
<td>CTS Positive (MRI; Severe level of fat in the carpal tunnel)</td>
<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
<td>index pos; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
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<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<td>Jarvik,J.G., 2002</td>
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<td>CTS suspects from 5 sites in Seattle</td>
<td>median to ulnar sensory peak and mixed nerve latency</td>
<td>Subjects</td>
<td>index pos; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
<td>.</td>
<td>index neg; MRI parameters (Nerve Conduction Studies (NCS); AANEM referenced and Katz Hand Diagram; classic or probable)</td>
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<td>AR</td>
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PPV|NPV | Sens|Spec | LR+|LR- |
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<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
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<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>68 patients with suspected CTS</td>
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<td>1.33</td>
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<td>STRONG</td>
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<td>68 patients with suspected CTS</td>
<td>ROC curve determined cutoffs</td>
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<td>0.43</td>
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<td>Extremities</td>
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<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Group2 (Reference Standard)</td>
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<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>High Quality</td>
<td>CTS Positive (Ultrasound; CSA inlet; &gt;9.7mm sq and Tinel Sign)</td>
<td>68 patients with suspected CTS</td>
<td>ROC curve determined cutoffs</td>
<td>Extremities</td>
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<td>68 patients with suspected CTS</td>
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<td>68 patients with suspected CTS</td>
<td>ROC curve determined cutoffs</td>
<td>Extremities</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<td>68 patients with suspected CTS</td>
<td>ROC curve determined cutoffs</td>
<td>Extremities</td>
<td>index pos; US locations; nerve swelling combinations to physical tests (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>68 patients with suspected CTS</td>
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<td>Extremities</td>
<td>index pos; US locations; nerve swelling combinations to physical tests (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Extremities</td>
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<td>Threshold Notes</td>
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<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
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<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<td>Naranjo.A., 2007</td>
<td>High Quality</td>
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<td>68 patients with suspected CTS</td>
<td>ROC curve determined cutoffs</td>
<td>Extremities</td>
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<td>High Quality</td>
<td>CTS Positive (Ultrasound; flattening index)</td>
<td>68 patients with suspected CTS</td>
<td>ROC curve determined cutoffs</td>
<td>Extremities</td>
<td>index pos; US locations; nerve swelling combinations to physical tests (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Tan.S.V., 2012 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hand held NCS (Examiner 1))</td>
<td>limbs of 100 CTS suspects</td>
<td>at least 2 abnormal EDS parameters</td>
<td>Extremities</td>
<td>index pos; hand held NCS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>CTS Positive (Hand held NCS (Examiner 2))</td>
<td>limbs of 100 CTS suspects</td>
<td>at least 2 abnormal EDS parameters</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Wong,S.M., 2004</td>
<td>High Quality</td>
<td>CTS Positive (Ultrasound; CSA proximal inlet; &gt;10mm sq)</td>
<td>120 CTS suspects referred to one hospital</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA &gt;.9 (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg:US CSA &gt;.9 (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.83</td>
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<td>Wong,S.M., 2004</td>
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<td>CTS Positive (Ultrasound; CSA proximal inlet; &gt;9mm sq)</td>
<td>120 CTS suspects referred to one hospital</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA &gt;.9 (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>High Quality</td>
<td>CTS Positive (Ultrasound; CSA max; &gt;10mm sq)</td>
<td>71 CTS suspects referred to outpatient clinic in Switzerland</td>
<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
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<td>index neg; CSA max; various cutoff levels (Nerve Conduction Studies (NCS); AANEM referenced and Rated Signs and Symptoms)</td>
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<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
<td>index pos; CSA max; various cutoff levels (Nerve Conduction Studies (NCS); AANEM referenced and Rated Signs and Symptoms)</td>
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<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<td>CTS Positive (Ultrasound; CSA max; &gt;12mm sq)</td>
<td>71 CTS suspects referred to outpatient clinic in Switzerland</td>
<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
<td>index pos; CSA max; various cutoff levels (Nerve Conduction Studies (NCS); AANEM referenced and Rated Signs and Symptoms)</td>
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<td>71 CTS suspects referred to outpatient clinic in Switzerland</td>
<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
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<td>Group2 (Reference Standard)</td>
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<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
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<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
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<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
<td>index pos; CSA max; various cutoff levels (Nerve Conduction Studies (NCS); AANEM referenced and Rated Signs and Symptoms)</td>
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<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Ziswiler, H.R., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Ultrasound; CSA max; &gt;9mm sq)</td>
<td>71 CTS suspects referred to outpatient clinic in Switzerland</td>
<td>motor and sensory latency cutoff values</td>
<td>Extremities</td>
<td>index pos; CSA max; various cutoff levels (Nerve Conduction Studies (NCS); AANEM referenced and Rated Signs and Symptoms)</td>
<td>index neg; CSA max; various cutoff levels (Nerve Conduction Studies (NCS); AANEM referenced and Rated Signs and Symptoms)</td>
<td>74</td>
<td>27</td>
<td>0.91</td>
<td>0.59</td>
<td>0.86</td>
<td>0.70</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group 1 N</td>
<td>Group 2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Sp ec</td>
<td>LR+</td>
<td>LR -</td>
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<tr>
<td>Abdel Ghaffar, M.K., 2012</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; bowing of flexor retinaculum)</td>
<td>41 suspected CTS patients from one hosp</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; US factors (Nerve Conduction Studies (NCS))</td>
<td>40</td>
<td>index neg; US factors (Nerve Conduction Studies (NCS))</td>
<td>13</td>
<td>0.95</td>
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<td>3</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA inlet; &gt;11mm sq)</td>
<td>41 suspected CTS patients from one hosp</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; US factors (Nerve Conduction Studies (NCS))</td>
<td>48</td>
<td>index neg; US factors (Nerve Conduction Studies (NCS))</td>
<td>5</td>
<td>0.94</td>
<td>0.4</td>
<td>0</td>
<td>0.94</td>
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<td>Abdel Ghaffar, M.K., 2012</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; nerve edema)</td>
<td>41 suspected CTS patients from one hosp</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; US factors (Nerve Conduction Studies (NCS))</td>
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<td>index neg; US factors (Nerve Conduction Studies (NCS))</td>
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<td>Abdel Ghaffar, M.K., 2012</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; nerve hypervascularization)</td>
<td>41 suspected CTS patients from one hosp</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; US factors (Nerve Conduction Studies (NCS))</td>
<td>49</td>
<td>index neg; US factors (Nerve Conduction Studies (NCS))</td>
<td>4</td>
<td>0.96</td>
<td>0.7</td>
<td>5</td>
<td>0.98</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA difference between CsL and CsP; &gt;2.5mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>.</td>
<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>PPV</td>
<td>NP V</td>
<td>Sens</td>
<td>Sp ec</td>
<td>LR+</td>
<td>LR -</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>Dejaco,C., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA difference between CsL and CsP; &gt;6.5mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>.</td>
<td>AR</td>
<td>0.42</td>
<td>0.93</td>
<td>3.58</td>
<td>0.63</td>
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<td>POOR</td>
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<td>Dejaco,C., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA difference between CsR and CsP; &gt;1.5mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>.</td>
<td>AR</td>
<td>0.96</td>
<td>0.32</td>
<td>1.41</td>
<td>0.11</td>
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<td>MODERA TE</td>
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<td>Dejaco,C., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA difference between CsR and CsP; &gt;5.5mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>.</td>
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<td>7.30</td>
<td>0.52</td>
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<td>POOR</td>
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<td>Dejaco,C., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA difference between CsS and CsP; &gt;5.5mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV N</td>
<td>NP V</td>
<td>Sens Sp</td>
<td>Specificity</td>
<td>LR+ LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>Dejaco,C., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA difference between CsS and CsP; &gt;5.5mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>.</td>
<td>.</td>
<td>AR</td>
<td>0.360.95</td>
<td>7.740.67</td>
<td>MODERATE</td>
<td>POOR</td>
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<td>Dejaco,C., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA Inlet (CsS); &gt;12.8mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>.</td>
<td>.</td>
<td>AR</td>
<td>0.360.92</td>
<td>4.330.70</td>
<td>WEAK</td>
<td>POOR</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA Inlet (CsS); &gt;8.8mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>.</td>
<td>.</td>
<td>AR</td>
<td>0.900.45</td>
<td>1.630.22</td>
<td>POOR</td>
<td>WEAK</td>
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<tr>
<td>Dejaco,C., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA max (CsL); &gt;13.8mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>4.660.67</td>
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<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Dejaco,C., 2013</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA max (CsL); &gt;9.8mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>0.92</td>
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<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA ratio between CsL and CSA proximal pronator quadrus (CsP); &gt;1.3)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA proximal inlet (CsR); &gt;9.8mm sq)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>PPV</td>
<td>NP V</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR -</td>
<td>Rule In Test</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA ratio between CsL and CSA proximal pronator quadrus (CsP); &gt;1.81)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>MODERA TE</td>
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<td>CTS Positive (Ultrasound; CSA ratio between CsR and CsP; &gt;1.25)</td>
<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>135 patients with suspected CTS; asymptomatic hands included</td>
<td>ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>MODERA TE</td>
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<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>MODERA TE</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>Group 2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Sp ec</td>
<td>LR+</td>
<td>LR -</td>
<td>Rule In Test</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA ratio between CsS and CsP; &gt;1.66)</td>
<td>135 patients with suspected CTS; asymptomatic hands included ranked as CTS by neurologist based on NCS and clinical assessment</td>
<td>Extremities</td>
<td>index pos; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
<td>.</td>
<td>index neg; US CSA levels (Clinical Diagnosis and Nerve Conduction Studies (NCS); &gt;90% neurologist confidence)</td>
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<td>5.66</td>
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<td>Fowler,J.R., 2014</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA proximal inlet; &gt;10mm sq)</td>
<td>referred for EDS</td>
<td>DML 4.2ms+ or DSL 3.2ms+</td>
<td>Subjects</td>
<td>index pos; US CSA (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>52</td>
<td>index neg; US CSA (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>33</td>
<td>0.90</td>
<td>0.7</td>
<td>6</td>
<td>0.85</td>
<td>0.8</td>
<td>3</td>
</tr>
<tr>
<td>Hashemi,A.-H., 2009</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA max; &gt;10mm sq)</td>
<td>50 CTS suspects referred to the hospital</td>
<td>NCV of median nerve in carpal tunnel and ring finger</td>
<td>Extremities</td>
<td>index pos; US (Nerve Conduction Studies (NCS))</td>
<td>60</td>
<td>index neg; US (Nerve Conduction Studies (NCS))</td>
<td>40</td>
<td>0.80</td>
<td>0.8</td>
<td>8</td>
<td>0.91</td>
<td>0.7</td>
<td>4</td>
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<tr>
<td>Kang,E.K., 2008</td>
<td>Moderate Quality</td>
<td>CTS Positive (Current Perception Threshold (CPT))</td>
<td>all women; 31 patients referred for NCS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; CPT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>34</td>
<td>index neg; CPT (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>26</td>
<td>0.59</td>
<td>0.6</td>
<td>5</td>
<td>0.69</td>
<td>0.5</td>
<td>5</td>
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<td>Lo,J.K., 2002</td>
<td>Moderate Quality</td>
<td>CTS Positive (Electromyograph y (EMG); APB deinnervation potentials)</td>
<td>charts of all patients suspected of CTS referred to outpatient EDS lab</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Subjects</td>
<td>index pos; EMG (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>48</td>
<td>index neg; EMG (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>300</td>
<td>0.92</td>
<td>0.5</td>
<td>8</td>
<td>0.26</td>
<td>0.9</td>
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<td>Mghtaderi, A., 2012</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA distal outlet; &gt;13.5mm sq)</td>
<td>CTS moderate or severe patients from one clinic vs upper limb pain controls</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Subjects</td>
<td>index pos; CSA prox and distal (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>16</td>
<td>index neg; CSA prox and distal (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>63</td>
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<td>0.36</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
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<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
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<td>Moderate Quality</td>
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<td>CTS moderate or severe patients from one clinic vs upper limb pain controls</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Subjects</td>
<td>index pos; CSA prox and distal (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; CSA prox and distal (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>34</td>
<td>45</td>
<td>0.88</td>
<td>0.8</td>
<td>7</td>
<td>0.83</td>
<td>0.9</td>
<td>1</td>
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<tr>
<td>Nakamichi, K ., 2002</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA inlet)</td>
<td>275 clinically diagnosed CTS patients</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>367</td>
<td>0.85</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA mid)</td>
<td>275 clinically diagnosed CTS patients</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>20</td>
<td>394</td>
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<tr>
<td>Nakamichi, K ., 2002</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA mid and CSA inlet)</td>
<td>275 clinically diagnosed CTS patients</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>0.9</td>
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<td>Nakamichi, K ., 2002</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA outlet)</td>
<td>275 clinically diagnosed CTS patients</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>355</td>
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<td>Nakamichi, K ., 2002</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA outlet and CSA inlet)</td>
<td>275 clinically diagnosed CTS patients</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>29</td>
<td>385</td>
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<td>0.9</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1</td>
<td>Group2</td>
<td>Group2 N</td>
<td>Group2 PPV/NPV</td>
<td>Sens/Spec</td>
<td>LR+/LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Nakamichi, K., 2002</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA outlet and CSA mid)</td>
<td>275 clinically diagnosed CTS patients</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>60</td>
<td>index neg; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>354</td>
<td>0.75</td>
<td>0.28</td>
<td>0.15</td>
<td>0.87</td>
<td>1.13</td>
<td>0.98</td>
</tr>
<tr>
<td>Nakamichi, K., 2002</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA outlet, CSA mid, and CSA inlet)</td>
<td>275 clinically diagnosed CTS patients</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>87</td>
<td>index neg; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>327</td>
<td>0.92</td>
<td>0.32</td>
<td>0.27</td>
<td>0.94</td>
<td>4.29</td>
<td>0.78</td>
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<tr>
<td>Nakamichi, K., 2002</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; no CSA abnormality at distal, mid, or proximal)</td>
<td>275 clinically diagnosed CTS patients</td>
<td>sensory and motor latency cutoffs</td>
<td>Extremities</td>
<td>index pos; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>98</td>
<td>index neg; US CSA locations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>316</td>
<td>0.51</td>
<td>0.21</td>
<td>0.17</td>
<td>0.58</td>
<td>0.39</td>
<td>1.45</td>
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<tr>
<td>Pastare, D., 2009</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA inlet; &gt;9mm sq)</td>
<td>66 CTS suspected patients referred to Neuro lab in Singapore hosp</td>
<td>sensory, motor, and LINT cutoffs</td>
<td>Extremities</td>
<td>index pos; CSA proximal (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>50</td>
<td>index neg; CSA proximal (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>47</td>
<td>0.96</td>
<td>0.51</td>
<td>0.68</td>
<td>0.92</td>
<td>8.79</td>
<td>0.35</td>
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<tr>
<td>Stalberg, E., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Automatic Carpal Tunnel Tester)</td>
<td>Only 178 hands readable on CT tester; 136 patients with presumptive CTS diagnosis</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; CT tester (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>49</td>
<td>index neg; CT tester (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>129</td>
<td>0.90</td>
<td>0.97</td>
<td>0.92</td>
<td>0.96</td>
<td>23.83</td>
<td>0.09</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Swen,W.A., 2001</td>
<td>Moderate Quality</td>
<td>CTS Positive (Distal Sensory Latency (DSL) difference from Ulnar; digit 4)</td>
<td>63 symptomatic patients visiting neuro clinic</td>
<td>Surgical relief on VAS scale; motor, mixed, sensory nerve cutoffs referenced for NCS</td>
<td>Subjects index pos; NCS; DSL; CSA (Surgical Relief of Symptoms; 90+ percent improvement on VAS scale after 3 months)</td>
<td>58 index neg; NCS; DSL; CSA (Surgical Relief of Symptoms; 90+ percent improvement on VAS scale after 3 months)</td>
<td>5</td>
<td>0.78</td>
<td>0.60</td>
<td>0.96</td>
<td>0.19</td>
<td>1.18</td>
<td>0.23</td>
<td>POOR</td>
<td>WEAK</td>
</tr>
</tbody>
</table>

| Swen,W.A., 2001 | Moderate Quality | CTS Positive (Nerve Conduction Studies (NCS); AANEM referenced) | 63 symptomatic patients visiting neuro clinic | Surgical relief on VAS scale; motor, mixed, sensory nerve cutoffs referenced for NCS | Subjects index pos; NCS; DSL; CSA (Surgical Relief of Symptoms; 90+ percent improvement on VAS scale after 3 months) | 59 index neg; NCS; DSL; CSA (Surgical Relief of Symptoms; 90+ percent improvement on VAS scale after 3 months) | 4 | 0.78|0.75 | 0.98|0.15 | 1.20|0.11 | POOR | MODERATE |

| Swen,W.A., 2001 | Moderate Quality | CTS Positive (Ultrasound; CSA inlet; Elipse Formula; >10mm sq) | 63 symptomatic patients visiting neuro clinic | Surgical relief on VAS scale; motor, mixed, sensory nerve cutoffs referenced for NCS | Subjects index pos; NCS; DSL; CSA (Surgical Relief of Symptoms; 90+ percent improvement on VAS scale after 3 months) | 39 index neg; NCS; DSL; CSA (Surgical Relief of Symptoms; 90+ percent improvement on VAS scale after 3 months) | 24 | 0.85|0.42 | 0.70|0.63 | 1.87|0.48 | POOR | WEAK |

<p>| Szopinski,K., 2011 | Moderate Quality | CTS Positive (Ultrasound; cross sectional shape; non-triangular) | 76 patients with clinical diagnosis of CTS | motor and sensory latency and velocity cutoff values Extremities | index pos; CS shape triangular, non triangular (Nerve Conduction Studies (NCS); AANEM referenced) | 124 index neg; CS shape triangular, non triangular (Nerve Conduction Studies (NCS); AANEM referenced) | 15 | 0.85|0.13 | 0.89|0.10 | 0.98|0.16 | POOR | POOR |</p>
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes Reported By</th>
<th>Group 1 (Reference Standard)</th>
<th>Group 2 (Reference Standard)</th>
<th>Group 1 N</th>
<th>Group 2 N</th>
<th>PPV[</th>
<th>NPV</th>
<th>Sens</th>
<th>Sp ec</th>
<th>LR+</th>
<th>LR</th>
<th>Rule In Test</th>
<th>Rule Out Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Szopinski,K., 2011</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; cross sectional shape; triangular)</td>
<td>76 patients with clinical diagnosis of CTS</td>
<td>motor and sensory latency and velocity cutoff values</td>
<td>Extremities</td>
<td>index pos; CS shape triangular, non triangular (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; CS shape triangular, non triangular (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>15</td>
<td>124</td>
<td>0.87[0.1</td>
<td>5</td>
<td>0.11[0.9</td>
<td>0</td>
<td>1.16[0.9</td>
<td>8</td>
<td>POOR</td>
<td>POOR</td>
</tr>
<tr>
<td>Weber,R.A., 2000</td>
<td>Moderate Quality</td>
<td>CTS Positive (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>53 patients with suspected CTS from one hosp</td>
<td>history and physical signs and symptoms</td>
<td>Extremities</td>
<td>index pos; NCS (Clinical Diagnosis)</td>
<td>index neg; NCS (Clinical Diagnosis)</td>
<td>67</td>
<td>39</td>
<td>0.64[0.7</td>
<td>2</td>
<td>0.80[0.5</td>
<td>4</td>
<td>1.73[0.3</td>
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<td>POOR</td>
<td>WEAK</td>
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<tr>
<td>Werner,R.A., 1994</td>
<td>Moderate Quality</td>
<td>CTS Positive (Vibratory Threshold)</td>
<td>130 line workers at a company with complaints of symptoms; 1 was unable to get NCS due to cast</td>
<td>median to ulnar sensory peak latency of &gt;.5ms</td>
<td>Subjects</td>
<td>index pos; VT (Nerve Conduction Studies (NCS))</td>
<td>index neg; VT (Nerve Conduction Studies (NCS))</td>
<td>8</td>
<td>121</td>
<td>0.13[0.7</td>
<td>9</td>
<td>0.04[0.9</td>
<td>3</td>
<td>0.57[1.0</td>
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<td>POOR</td>
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<tr>
<td>Werner,R.A., 1995</td>
<td>Moderate Quality</td>
<td>CTS Positive (Vibratory Threshold; Jetzer Index)</td>
<td>patients recruited from 2 manufacturing plants; current symptoms not required</td>
<td>median to ulnar sensory peak latency of &gt;.5ms</td>
<td>Subjects</td>
<td>index pos; VT Jetzer (Nerve Conduction Studies (NCS))</td>
<td>index neg; VT Jetzer (Nerve Conduction Studies (NCS))</td>
<td>80</td>
<td>87</td>
<td>0.31[0.8</td>
<td>2</td>
<td>0.61[0.5</td>
<td>6</td>
<td>1.40[0.6</td>
<td>9</td>
<td>POOR</td>
<td>POOR</td>
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<tr>
<td>Yazdchi,M., 2012</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA inlet; &gt;12.5mm sq)</td>
<td>90 CTS suspected patients</td>
<td>motor and sensory latency responses</td>
<td>Extremities</td>
<td>index pos; US variations (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; US variations (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>121</td>
<td>59</td>
<td>0.92[0.2</td>
<td>5</td>
<td>0.72[0.6</td>
<td>0</td>
<td>1.79[0.4</td>
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<td>POOR</td>
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<td>Reference Title</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Group2 (Reference Standard)</td>
<td>Group 1 N</td>
<td>Group 2 N</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
<td>LR+</td>
<td>LR-</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<tr>
<td>Yazdchi, M., 2012</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA outlet; &gt;11.5mm sq)</td>
<td>90 CTS suspected patients</td>
<td>motor and sensory latency responses</td>
<td>Extremities</td>
<td>index pos; US variations (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; US variations (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>129</td>
<td>51</td>
<td>0.91</td>
<td>0.2 7</td>
<td>0.76</td>
<td>0.5 6</td>
<td>1.73</td>
<td>0.4 3</td>
<td>POOR</td>
<td>WEAK</td>
</tr>
<tr>
<td>Yazdchi, M., 2012</td>
<td>Moderate Quality</td>
<td>CTS Positive (Ultrasound; CSA proximal inlet; &gt;11.5mm sq)</td>
<td>90 CTS suspected patients</td>
<td>motor and sensory latency responses</td>
<td>Extremities</td>
<td>index pos; US variations (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>index neg; US variations (Nerve Conduction Studies (NCS) and Electromyography (EMG))</td>
<td>129</td>
<td>51</td>
<td>0.91</td>
<td>0.2 7</td>
<td>0.76</td>
<td>0.5 6</td>
<td>1.73</td>
<td>0.4 3</td>
<td>POOR</td>
<td>WEAK</td>
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### TABLE 22: LOW QUALITY STUDIES- PICO 3 (IMAGING MODALITIES VERSUS REFERENCE STANDARD)

| Reference Title | Quality | Outcome (Index Test) | Patient Characteristics | Threshold Notes | Outcomes Reported By | Group 1 (Reference Standard) | Group 2 (Reference Standard) | PPV|NPV | Sens|Sp ec | LR+|LR - | Rule In Test | Rule Out Test |
|-----------------|---------|----------------------|-------------------------|-----------------|----------------------|-----------------------------|-----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|
| Beckenbaugh, R. D., 1995 | Low Quality | CTS Positive (Hand Held Electroneurometer; motor latency >2.8ms) | 45 CTS suspected patients | sensory, motor, and mixed nerve cutoffs | Extremities | index pos; hand held EMG; ML cutoffs (Electromyography (EMG)) | 63 | index neg; hand held EMG; ML cutoffs (Electromyography (EMG)) | 1 | 0.89|1.0 0 | 1.00|0.1 3 | 1.14|0.0 0 | POOR | STRONG |
| Beckenbaugh, R. D., 1995 | Low Quality | CTS Positive (Hand Held Electroneurometer; motor latency >3.2ms) | 45 CTS suspected patients | sensory, motor, and mixed nerve cutoffs | Extremities | index pos; hand held EMG; ML cutoffs (Electromyography (EMG)) | 59 | index neg; hand held EMG; ML cutoffs (Electromyography (EMG)) | 5 | 0.93|0.8 0 | 0.98|0.5 0 | 1.96|0.0 4 | POOR | STRONG |
| Beckenbaugh, R. D., 1995 | Low Quality | CTS Positive (Hand Held Electroneurometer; motor latency >3.7ms) | 45 CTS suspected patients | sensory, motor, and mixed nerve cutoffs | Extremities | index pos; hand held EMG; ML cutoffs (Electromyography (EMG)) | 55 | index neg; hand held EMG; ML cutoffs (Electromyography (EMG)) | 9 | 0.96|0.6 7 | 0.95|0.7 5 | 3.79|0.0 7 | WEAK | STRONG |
| Beckenbaugh, R. D., 1995 | Low Quality | CTS Positive (Hand Held Electroneurometer; motor latency >3.9ms) | 45 CTS suspected patients | sensory, motor, and mixed nerve cutoffs | Extremities | index pos; hand held EMG; ML cutoffs (Electromyography (EMG)) | 49 | index neg; hand held EMG; ML cutoffs (Electromyography (EMG)) | 15 | 0.98|0.4 7 | 0.86|0.8 8 | 6.86|0.1 6 | MODERE TE | MODERE TE |
| Beckenbaugh, R. D., 1995 | Low Quality | CTS Positive (Hand Held Electroneurometer; motor latency >4.3ms) | 45 CTS suspected patients | sensory, motor, and mixed nerve cutoffs | Extremities | index pos; hand held EMG; ML cutoffs (Electromyography (EMG)) | 39 | index neg; hand held EMG; ML cutoffs (Electromyography (EMG)) | 25 | 0.97|0.2 8 | 0.68|0.8 8 | 5.43|0.3 7 | MODERE TE | WEAK |
| Beckenbaugh, R. D., 1995 | Low Quality | CTS Positive (CT; Distal Area) | patients referred to Neuro services for suspected CTS | Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (LR+), negative likelihood ratio (LR-) | | | | | | | | | | |
| Deniz, F.E., 2012 | Low Quality | CTS Positive (CT; Distal Area) | patients referred to Neuro services for suspected CTS | Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (LR+), negative likelihood ratio (LR-) | | | | | | | | | | |
| Reference Title | Quality | Outcome (Index/Test) | Patient Characteristics | Threshold Notes | Group 1 Outcomes Reported By | Group 1 N | Group 2 Outcomes Reported By | Group 2 N | PPV|NP V | Sens|Sp ec | LR+|LR - | Rule In | Rule Out | Test |
|-----------------|---------|---------------------|-------------------------|-----------------|-------------------------------|---------|-------------------------------|---------|--------|--------|----------|--------|--------|--------|----------|------|
| Deniz,F.E., 2012 | Low Quality | CTS Positive (CT; Distal Density) | patients referred to Neuro services for suspected CTS | Subjects | index pos; MRI; CT; EMG (Clinical Diagnosis) | 39 | index neg; MRI; CT; EMG (Clinical Diagnosis) | 39 | AR | 0.71|0.75 | 2.82|0.39 | WEA K | WEA K |
| Deniz,F.E., 2012 | Low Quality | CTS Positive (CT; Proximal Area) | patients referred to Neuro services for suspected CTS | Subjects | index pos; MRI; CT; EMG (Clinical Diagnosis) | 39 | index neg; MRI; CT; EMG (Clinical Diagnosis) | 39 | AR | 0.97|0.47 | 1.82|0.06 | POOR | STRONG |
| Deniz,F.E., 2012 | Low Quality | CTS Positive (CT; Proximal Density) | patients referred to Neuro services for suspected CTS | Subjects | index pos; MRI; CT; EMG (Clinical Diagnosis) | 39 | index neg; MRI; CT; EMG (Clinical Diagnosis) | 39 | AR | 0.68|0.80 | 3.38|0.41 | WEA K | WEA K |
| Deniz,F.E., 2012 | Low Quality | CTS Positive (Electromyography (EMG)) | patients referred to Neuro services for suspected CTS | Subjects | index pos; MRI; CT; EMG (Clinical Diagnosis) | 69 | index neg; MRI; CT; EMG (Clinical Diagnosis) | 69 | AR | 0.91|0.81 | 4.84|0.11 | WEA K | MODERATE |
| Deniz,F.E., 2012 | Low Quality | CTS Positive (MRI; Distal Area) | patients referred to Neuro services for suspected CTS | Subjects | index pos; MRI; CT; EMG (Clinical Diagnosis) | 50 | index neg; MRI; CT; EMG (Clinical Diagnosis) | 50 | AR | 0.65|0.80 | 3.25|0.44 | WEA K | WEA K |
| Deniz,F.E., 2012 | Low Quality | CTS Positive (MRI; Distal Intensity) | patients referred to Neuro services for suspected CTS | Subjects | index pos; MRI; CT; EMG (Clinical Diagnosis) | 50 | index neg; MRI; CT; EMG (Clinical Diagnosis) | 50 | AR | 0.88|0.40 | 1.46|0.31 | POOR | WEA K |
| Deniz,F.E., 2012 | Low Quality | CTS Positive (MRI; Proximal Area) | patients referred to Neuro services for suspected CTS | Subjects | index pos; MRI; CT; EMG (Clinical Diagnosis) | 50 | index neg; MRI; CT; EMG (Clinical Diagnosis) | 50 | AR | 0.43|1.00 | 10.00|0.58 | STRONG | POOR |
| Deniz,F.E., 2012 | Low Quality | CTS Positive (MRI; Proximal Intensity) | patients referred to Neuro services for suspected CTS | Subjects | index pos; MRI; CT; EMG (Clinical Diagnosis) | 50 | index neg; MRI; CT; EMG (Clinical Diagnosis) | 50 | AR | 0.88|0.60 | 2.19|0.21 | WEA K | WEA K |
| Glowacki,K.A., 1996 | Low Quality | CTS Positive (Electrodiagnostic Studies; NCS/EMG; AANEM referenced) | 93 clinically diagnosed CTS surgical patients undergoing EDS | Extremities | index pos; EDS; emg/ncs (Surgical Relief of Symptoms; resolved or improved) | 99 | index neg; EDS; emg/ncs (Surgical Relief of Symptoms; resolved or improved) | 27 | 0.93|0.07 | 0.79|0.22 | 1.01|0.96 | POOR | POOR |
| Reference Title | Quality | Outcome (Index Test) | Patient Characteristics | Threshold Notes | Outcomes Reported By | Group1 (Reference Standard) | Group2 (Reference Standard) | Group 1 N | Group 2 N | PPV|NP | Sens|Sp e | LR+|LR - | Rule In Test | Rule Out Test |
|----------------|---------|----------------------|-------------------------|-----------------|----------------------|-----------------------------|-----------------------------|----------|----------|------|------|-------|-------|-------|----------------|----------------|
| Kaul,M.P., 2002 | Low Quality | CTS Positive (2L-INT) | obtainable responses from 158 subjects | palm diff rates referenced | Subjects | index pos; 2L-INT (Nerve Conduction Studies (NCS); palm-diff) | index neg; 2L-INT (Nerve Conduction Studies (NCS); palm-diff) | 78 | 51 | 0.92|0.8 8 | 0.92|0.8 8 | 7.85|0.0 9 | MODERA TE | STRONG |
| Mallouhi,A., 2006 | Low Quality | CTS Positive (Ultrasound; nerve edema) | clinically suspected CTS suspects from database | motor, mixed, sensory nerve cutoffs referenced | Extremities | index pos; US edema; US hypertensive (Nerve Conduction Studies (NCS)) | index neg; US edema; US hypertensive (Nerve Conduction Studies (NCS)) | 149 | 57 | 0.92|0.3 9 | 0.80|0.6 5 | 2.26|0.3 1 | WEAK | WEAK |
| Mallouhi,A., 2006 | Low Quality | CTS Positive (Ultrasound; nerve hypertensive rigid) | clinically suspected CTS suspects from database | motor, mixed, sensory nerve cutoffs referenced | Extremities | index pos; US edema; US hypertensive (Nerve Conduction Studies (NCS)) | index neg; US edema; US hypertensive (Nerve Conduction Studies (NCS)) | 174 | 32 | 0.94|0.7 5 | 0.95|0.7 1 | 3.24|0.0 7 | WEAK | STRONG |
| Missere,M., 1999 | Low Quality | CTS Positive (Ultrasound; M Index) | 45 workers recruited for potential job risk of CTS | motor, mixed, sensory nerve cutoffs referenced | Extremities | index pos; US M index (M space decrease) (Electromyography (EMG)) | index neg; US M index (M space increase) (Electromyography (EMG)) | 61 | 29 | 0.36|0.8 6 | 0.85|0.3 9 | 1.39|0.3 9 | POOR | WEAK |
| Sheean,G.L., 1995 | Low Quality | CTS Positive (2L-INT; DML) | virtually consecutively suspected CTS patients | motor, mixed, sensory nerve cutoffs referenced | Extremities | index pos; 2L-INT-DML (Nerve Conduction Studies (NCS); AANEM referenced) | index neg; 2L-INT-DML (Nerve Conduction Studies (NCS); AANEM referenced) | 49 | 17 | 0.98|0.9 4 | 0.98|0.9 4 | 16.65|0.0 2 | STRONG | STRONG |
| Smith,T., 1998 | Low Quality | CTS Positive (Electromyography (EMG); Sensory Nerve Conduction (SNC); Needle; AANEM referenced) | CTS suspected patients referred to neuro dept | SCN cutoffs | Subjects | index pos; EMG SNC (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC); Surface; AANEM referenced) | index neg; EMG SNC (Nerve Conduction Studies (NCS); Sensory Nerve Conduction (SNC); Surface; AANEM referenced) | 44 | 38 | 0.84|0.9 2 | 0.93|0.8 3 | 5.55|0.0 9 | MODERA TE | STRONG |
DIAGNOSTIC SCALES

Moderate evidence supports that diagnostic questionnaires and/or electrodiagnostic studies could be used to aid the diagnosis of carpal tunnel syndrome.

Strength of Recommendation: Moderate Evidence

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

Rationale
The evaluation of diagnostic tools, either scales based on clinically acquired information from the history and physical examination, or electrodiagnostic tests, requires a clear consensus on a reference standard against which the performance of these diagnostic tests can be compared. This type of consensus still does not exist with respect to carpal tunnel syndrome. It is recognized that electrodiagnostic testing has long been considered to represent a reference standard but this assumption is untenable because these tests clearly have false positive and negative results. Beyond this there simply is no consensus supporting any single diagnostic tool as a reference standard. Where clinical diagnostic scales are taken as the reference standard, electrodiagnostic tests may demonstrate poor sensitivity and specificity. The same is true of clinical diagnostic scales when electrodiagnostic tests are taken as the reference standard. Agreement between electrodiagnostic tests and clinical diagnostic tests, regardless of which is taken as the reference standard, is also complicated by the binary nature of the comparison. Electrodiagnostic data is, by and large, continuous in nature and so establishing a hard cutoff point to compare to clinical diagnostic scales seems potentially arbitrary. At least one of the clinical diagnostic scales, the CTS-6, attempts to address this by defining the diagnosis in probabilistic terms as a continuous variable. Given this set of circumstances the Workgroup sought to evaluate the role of clinical diagnostic tests and electrodiagnostic testing in the evaluation of CTS in the context in which they are used, in other words, in clinical settings where a patient presents with complaints that might be attributable to this condition.

There were two clinical diagnostic tests studied in high quality investigations, the Katz Hand Diagram and the CTS-6. The Boston Carpal Tunnel Scale, a status instrument most frequently used to measure outcomes of treatment for CTS was also evaluated in two high quality studies.

In comparison to electrodiagnostic testing Katz et al demonstrated high sensitivity (0.96) and good negative predictive value (0.91) for the “classic”, “probable” or “possible” designations however, positive predictive value and specificity were low. This indicates that, using electrodiagnostic testing as a reference standard, the Katz Hand Diagram used in this way had more value as a “rule out test”. Sensitivity decreased and specificity increased if comparison to electrodiagnostic tests was made only using “classic” or “probable” results. Sensitivity decreased further and specificity was commensurately increased when only “classic” results were compared to electrodiagnostic testing. Defined using only “classic” or “classic” or “probable” results the Katz Hand Diagram was considered weak or poor as either a “rule in” or “rule out” test. Vanti made similar observations using AANEM electrodiagnostic definitions for CTS in demonstrating that the “classic” or “probable” results functioned as a strong “rule out” test.
Graham took a different approach to evaluating the respective roles of electrodiagnostic testing and the CTS-6, an instrument that expresses the probability of CTS. The pre-test probability of CTS was established using the CTS-6 and then the post-test probability after electrodiagnostic testing was estimated using likelihood ratios established with two electrodiagnostic standards for CTS, one lax (with higher sensitivity and lower specificity) and one stringent (with lower sensitivity and higher specificity). This study showed that the changes in probability after electrodiagnostic testing, using either electrodiagnostic definition, were small and probably below a clinically relevant standard. This suggests that the most appropriate setting for electrodiagnostic testing is where there is uncertainty about the clinical diagnosis.

There were two high quality studies evaluating the Boston Carpal Tunnel Syndrome Questionnaire (Wainner, Naranjo). Both of these studies used electrodiagnostic tests as the reference standard. The results were consistent in both studies in showing that this instrument functioned as either a weak or poor “rule in” or “rule out” test. This may have been due to the fact that the scale was actually developed as a status instrument rather than as a diagnostic scale.

**Risks and Harms of Implementing this Recommendation**

While diagnostic scales/questionnaires can be used for the clinical assessment of CTS, they may be unable to exclude other etiologies that could mimic CTS (such as cervical radiculopathy), or identify other disorders (such as polyneuropathy) that may affect the decision making process regarding therapy. Where indicated, appropriate clinical evaluation for alternative diagnoses should be carried out. Electrodiagnostic testing may be of most value when the clinical diagnosis is unclear or when atypical features exist.

**Future Research**

Establishing consensus on a reference standard for the diagnosis for CTS is the most important research goal in this area.
### QUALITY TABLE OF DIAGNOSTIC SCALES

**Table 23. Diagnostic Quality Evaluations**

<table>
<thead>
<tr>
<th>Study</th>
<th>Representative Population</th>
<th>Clear Selection Criteria</th>
<th>Detailed Enough to Replicate</th>
<th>Reference Standard Identifies Target Condition</th>
<th>Blinding</th>
<th>Other Bias?</th>
<th>Inclusion</th>
<th>Strength</th>
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<td>Atroshi,I., 2003</td>
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<td>Bland,J.D., 2014</td>
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<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
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<td>Calfee,R.P., 2012</td>
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<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
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<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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<td>Dale,A.M., 2011</td>
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<td>●</td>
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<td>Moderate Quality</td>
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<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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<tr>
<td>Fowler,J.R., 2014</td>
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<td>○</td>
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<td>Franzblau,A., 1994</td>
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<td>Graham,B., 2008</td>
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<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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<td>Moderate Quality</td>
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<td>○</td>
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<td>High Quality</td>
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<td>Yagci,I., 2010</td>
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<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Include</td>
<td>Moderate Quality</td>
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</table>
RESULTS
SUMMARY OF DATA FINDINGS

TABLE 24: SUMMARY OF FINDINGS- INDEX TEST VERSUS AANEM REFERENCED EDS

<table>
<thead>
<tr>
<th>LR +</th>
<th>LR -</th>
<th></th>
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<tr>
<td>≥10</td>
<td>≤0.1</td>
<td>In &quot;STRONG&quot; agreement with the reference standard</td>
</tr>
<tr>
<td>≥5 but &lt;10</td>
<td>&gt;0.1 but &lt;0.2</td>
<td>In &quot;MODERATE&quot; agreement with the reference standard</td>
</tr>
<tr>
<td>&gt;2 and &lt;5</td>
<td>&gt;0.2 but &lt;0.5</td>
<td>In &quot;WEAK&quot; agreement with the reference standard</td>
</tr>
<tr>
<td>≤2</td>
<td>&gt;0.5</td>
<td>In &quot;POOR&quot; agreement with the reference standard</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Index Test</th>
<th>Rule In/Out</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CTS-6; Stringent; 80+%</strong></td>
<td>RULE IN</td>
<td>RULE OUT</td>
<td>RULE IN</td>
<td>RULE OUT</td>
</tr>
<tr>
<td></td>
<td>RULE IN</td>
<td>RULE OUT</td>
<td>RULE IN</td>
<td>RULE OUT</td>
</tr>
<tr>
<td>Katz Hand Diagram; classic or probable</td>
<td>RULE IN</td>
<td>RULE OUT</td>
<td>RULE IN</td>
<td>RULE OUT</td>
</tr>
<tr>
<td></td>
<td>RULE IN</td>
<td>RULE OUT</td>
<td>RULE IN</td>
<td>RULE OUT</td>
</tr>
<tr>
<td>Katz Hand Diagram; classic</td>
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<td>RULE OUT</td>
<td>RULE IN</td>
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<tr>
<td></td>
<td>RULE IN</td>
<td>RULE OUT</td>
<td>RULE IN</td>
<td>RULE OUT</td>
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</table>

Table only displays index tests with more than one article of supporting evidence

**As displayed in the full data sheet, Graham,B., 2008 presents a high quality article with varying methodology to evaluate the utility of CTS-6 as compared to EDS AAEM as well**
## Table 25: Summary of Findings - Index Test versus General EDS Methods

<table>
<thead>
<tr>
<th>Index Test</th>
<th>Rule In/Out</th>
<th>(High Quality)</th>
<th>(Moderate Quality)</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Katz Hand Diagram; classic</td>
<td>RULE IN</td>
<td>Katz, J.N., 1990 (B)</td>
<td>Katz, J.N., 1990 (C)</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>Katz Hand Diagram; classic or probable</td>
<td>RULE IN</td>
<td>Calfee, R.P., 2012 (1)</td>
<td>Calfee, R.P., 2012 (2)</td>
<td>✔️</td>
</tr>
<tr>
<td></td>
<td>RULE OUT</td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
<tr>
<td>Katz Hand Diagram; classic, probable, or possible</td>
<td>RULE IN</td>
<td>Cartwright, M.S., 2013 (1)</td>
<td>Cartwright, M.S., 2013 (2)</td>
<td>✔️</td>
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<tr>
<td></td>
<td>RULE OUT</td>
<td></td>
<td></td>
<td>✔️</td>
</tr>
</tbody>
</table>

*Table only displays index tests with more than one article of supporting evidence*

*Authors with parenthetical numbers indicate a change in EDS method/threshold, alternate limbs, or alternate examiner*

*Authors with parenthetical letters indicate a unique study with the same author and year as another study listed in the guideline*
### TABLE 26: HIGH QUALITY STUDIES: PICO 4 (DIAGNOSTIC SCALES VERSUS REFERENCE STANDARD)

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes reported by:</th>
<th>Group1 (Reference Standard)</th>
<th>Group2 (Reference Standard)</th>
<th>Group 1 N</th>
<th>Group 2 N</th>
<th>Coefficient of Average Change in Probability (Pre-Post Test)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graham,B., 2008</td>
<td>High Quality</td>
<td>CTS Positive (CTS-6; Stringent; 80+%)</td>
<td>patients referred to EDS lab in a tertiary care center</td>
<td>Stringent Sensory Latency 2.27+ms</td>
<td>Subjects</td>
<td>index pos; CTS 6 stringent (Nerve Conduction Studies (NCS); AAEM referenced)</td>
<td>index neg; CTS 6 stringent (Nerve Conduction Studies (NCS); AAEM referenced)</td>
<td>104</td>
<td>39</td>
<td>-0.02</td>
<td>0.1</td>
</tr>
<tr>
<td>Graham,B., 2008</td>
<td>High Quality</td>
<td>CTS Positive (CTS-6; Stringent; 80+%)</td>
<td>patients referred to EDS lab in a tertiary care center</td>
<td>Stringent Sensory Latency 2.27+ms</td>
<td>Subjects</td>
<td>index pos; CTS 6 very stringent (Nerve Conduction Studies (NCS); AAEM referenced)</td>
<td>index neg; CTS 6 very stringent (Nerve Conduction Studies (NCS); AAEM referenced)</td>
<td>84</td>
<td>59</td>
<td>-0.02</td>
<td>0.1</td>
</tr>
<tr>
<td>Graham,B., 2008</td>
<td>High Quality</td>
<td>CTS Positive (CTS-6; Stringent; 80+%)</td>
<td>patients referred to EDS lab in a tertiary care center</td>
<td>Lax Sensory Latency &gt;2ms</td>
<td>Subjects</td>
<td>index pos; CTS 6 stringent (Nerve Conduction Studies (NCS); AAEM referenced)</td>
<td>index neg; CTS 6 stringent (Nerve Conduction Studies (NCS); AAEM referenced)</td>
<td>104</td>
<td>39</td>
<td>-0.06</td>
<td>0.2</td>
</tr>
<tr>
<td>Graham,B., 2008</td>
<td>High Quality</td>
<td>CTS Positive (CTS-6; Stringent; 80+%)</td>
<td>patients referred to EDS lab in a tertiary care center</td>
<td>Lax Sensory Latency &gt;2ms</td>
<td>Subjects</td>
<td>index pos; CTS 6 very stringent (Nerve Conduction Studies (NCS); AAEM referenced)</td>
<td>index neg; CTS 6 very stringent (Nerve Conduction Studies (NCS); AAEM referenced)</td>
<td>84</td>
<td>59</td>
<td>-0.01</td>
<td>0.1</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Group2 N</td>
<td>PPV</td>
<td>NPV</td>
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<tr>
<td>Katz, J.N., 1990 (B)</td>
<td>High Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>discomfort patients suspected of CTS</td>
<td>referenced sensory and motor cutoffs</td>
<td>Subjects</td>
<td>index pos; katz (Nerve Conduction Studies (NCS))</td>
<td>46</td>
<td>index neg; katz (Nerve Conduction Studies (NCS))</td>
<td>64</td>
<td>0.59</td>
<td>0.73</td>
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<tr>
<td>Katz, J.N., 1990 (C)</td>
<td>High Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic)</td>
<td>110 suspected CTS patients referred to one hosp</td>
<td>motor latency, sensory latency, and sensory velocity cutoffs</td>
<td>Extremities</td>
<td>index pos; katz levels (Nerve Conduction Studies (NCS))</td>
<td>30</td>
<td>index neg; katz levels (Nerve Conduction Studies (NCS))</td>
<td>115</td>
<td>0.60</td>
<td>0.70</td>
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<tr>
<td>Katz, J.N., 1990 (C)</td>
<td>High Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>110 suspected CTS patients referred to one hosp</td>
<td>motor latency, sensory latency, and sensory velocity cutoffs</td>
<td>Extremities</td>
<td>index pos; katz levels (Nerve Conduction Studies (NCS))</td>
<td>59</td>
<td>index neg; katz levels (Nerve Conduction Studies (NCS))</td>
<td>86</td>
<td>0.58</td>
<td>0.78</td>
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<tr>
<td>Katz, J.N., 1990 (C)</td>
<td>High Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic, probable, or possible)</td>
<td>110 suspected CTS patients referred to one hosp</td>
<td>motor latency, sensory latency, and sensory velocity cutoffs</td>
<td>Extremities</td>
<td>index pos; katz levels (Nerve Conduction Studies (NCS))</td>
<td>122</td>
<td>index neg; katz levels (Nerve Conduction Studies (NCS))</td>
<td>23</td>
<td>0.42</td>
<td>0.91</td>
</tr>
<tr>
<td>Lo, J.K., 2009</td>
<td>High Quality</td>
<td>CTS Positive (Clinical point-score system; &gt;10)</td>
<td>all CTS suspects chosen from a group of 348 as the patients with highest risk factors for CTS</td>
<td>sensory, motor, or combination of abnormalities</td>
<td>Subjects</td>
<td>index pos; clinical point-score system; &gt;10 = CTS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>164</td>
<td>index neg; clinical point-score system; &gt;10 = CTS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>114</td>
<td>0.32</td>
<td>0.16</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
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</tr>
<tr>
<td>Naranjo,A., 2007</td>
<td>High Quality</td>
<td>CTS Positive (Boston Carpal Tunnel Questionnaire (BCTQ); Functional severity scale)</td>
<td>68 patients with suspected CTS</td>
<td>BCTQ cutoff at &gt;3</td>
<td>Extremities</td>
<td>index pos; BCTQ FSS, SSS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; BCTQ FSS, SSS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>0.76</td>
<td>0.24</td>
<td>0.35</td>
<td>0.64</td>
</tr>
<tr>
<td>Naranjo,A., 2007</td>
<td>High Quality</td>
<td>CTS Positive (Boston Carpal Tunnel Questionnaire (BCTQ); Symptom severity scale)</td>
<td>68 patients with suspected CTS</td>
<td>BCTQ cutoff at &gt;3</td>
<td>Extremities</td>
<td>index pos; BCTQ FSS, SSS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; BCTQ FSS, SSS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>0.80</td>
<td>0.27</td>
<td>0.49</td>
<td>0.60</td>
</tr>
<tr>
<td>Vanti,C., 2012</td>
<td>High Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>limbs of 47 patients</td>
<td>Extremities</td>
<td>index pos; katz (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; katz (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>0.56</td>
<td>1.00</td>
<td>1.00</td>
<td>0.45</td>
<td>1.81</td>
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<tr>
<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Boston Carpal Tunnel Questionnaire (BCTQ); Functional severity scale; &gt;2.5)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; BCTQ FSS, SSS; katz; wrist ratio (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; BCTQ FSS, SSS; katz; wrist ratio (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>0.50</td>
<td>0.71</td>
<td>0.36</td>
<td>0.81</td>
<td>1.93</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
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<tr>
<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Boston Carpal Tunnel Questionnaire (BCTQ); Symptom severity scale; &gt;1.9)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; BCTQ FSS, SSS; katz; wrist ratio (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>60</td>
<td>index neg; BCTQ FSS, SSS; katz; wrist ratio (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>22</td>
<td>0.42</td>
<td>0.86</td>
<td>0.89</td>
</tr>
<tr>
<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; BCTQ FSS, SSS; katz; wrist ratio (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>68</td>
<td>index neg; BCTQ FSS, SSS; katz; wrist ratio (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>14</td>
<td>0.31</td>
<td>0.50</td>
<td>0.75</td>
</tr>
<tr>
<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Wrist Ratio Index; &gt;.67)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; BCTQ FSS, SSS; katz; wrist ratio (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>66</td>
<td>index neg; BCTQ FSS, SSS; katz; wrist ratio (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>16</td>
<td>0.39</td>
<td>0.88</td>
<td>0.93</td>
</tr>
<tr>
<td>Wainner,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Clinical Prediction Rule; 2 or more pos tests)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>70</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>8</td>
<td>0.36</td>
<td>0.88</td>
<td>0.96</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Threshold Notes)</td>
<td>Group2 (Threshold Notes)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
<td>Spec</td>
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<tr>
<td>Wainer,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Clinical Prediction Rule; 3 or more pos tests)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>49</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>29</td>
<td>0.51</td>
<td>0.97</td>
<td>0.96</td>
</tr>
<tr>
<td>Wainer,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Clinical Prediction Rule; 4 or more pos tests)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>29</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>49</td>
<td>0.69</td>
<td>0.88</td>
<td>0.77</td>
</tr>
<tr>
<td>Wainer,R.S., 2005</td>
<td>High Quality</td>
<td>CTS Positive (Clinical Prediction Rule; all 5 pos tests; sympt improve by shaking, WR &gt;.67, SSS &gt;1.9, thumb deficit, age &gt;45)</td>
<td>CTS and cervical radiculopathy suspects</td>
<td>Subjects</td>
<td>index pos; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>6</td>
<td>index neg; history questions; age; clinical combinations (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>72</td>
<td>0.83</td>
<td>0.71</td>
<td>0.19</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NPV</td>
<td>Sens</td>
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<tr>
<td>Westerman, D., 2012</td>
<td>High Quality</td>
<td>CTS Positive (Clinical Prediction; History and Physical; CTS vs Uncertain or No CTS)</td>
<td>CTS suspected referrals; 3 did not receive reference standard evaluation</td>
<td>Subjects index pos; clinical prediction (ranked by case history and physical exam) (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>84</td>
<td>index neg; clinical prediction (ranked by case history and physical exam) (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>35</td>
<td>0.94</td>
<td>0.57</td>
<td>0.84</td>
<td>0.80</td>
</tr>
</tbody>
</table>
**TABLE 27: MODERATE QUALITY STUDIES: PICO 4 (DIAGNOSTIC SCALES VERSUS REFERENCE STANDARD)**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes Reported By</th>
<th>Outcomes Reported By</th>
<th>Group 1 (Reference Standard)</th>
<th>Group 2 (Reference Standard)</th>
<th>Rule In Test</th>
<th>Rule Out Test</th>
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</thead>
<tbody>
<tr>
<td>Atroshi, I., 2003</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>254 symptomatic responders to a mass survey mailing completed the hand diagram</td>
<td>physical tests, signs, and history</td>
<td>Subjects</td>
<td>index pos; katz (Clinical Diagnosis)</td>
<td>188</td>
<td>index neg; katz (Clinical Diagnosis)</td>
<td>66</td>
<td>0.44</td>
</tr>
<tr>
<td>Bonauto, D. K., 2008</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic)</td>
<td>workers from various sites with current hand symptoms</td>
<td>motor and sensory latency cutoff values</td>
<td>Subjects</td>
<td>index pos; katz levels (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>24</td>
<td>index neg; katz levels (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>229</td>
<td>0.63</td>
</tr>
<tr>
<td>Bonauto, D. K., 2008</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>workers from various sites with current hand symptoms</td>
<td>motor and sensory latency cutoff values</td>
<td>Subjects</td>
<td>index pos; katz levels (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>56</td>
<td>index neg; katz levels (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>197</td>
<td>0.48</td>
</tr>
<tr>
<td>Bonauto, D. K., 2008</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic, probable, or possible)</td>
<td>workers from various sites with current hand symptoms</td>
<td>motor and sensory latency cutoff values</td>
<td>Subjects</td>
<td>index pos; katz levels (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>127</td>
<td>index neg; katz levels (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>126</td>
<td>0.52</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV NP</td>
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<tr>
<td>Calfee,R.P., 2012 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Motor Latency (DML))</td>
<td>57</td>
<td>index neg; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Motor Latency (DML))</td>
<td>162</td>
<td>0.30 0.79</td>
<td>0.33 0.76</td>
</tr>
<tr>
<td>Calfee,R.P., 2012 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Median Nerve Digit Score (MNDS); 2 digits)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Motor Latency (DML))</td>
<td>78</td>
<td>index neg; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Motor Latency (DML))</td>
<td>141</td>
<td>0.36 0.84</td>
<td>0.55 0.70</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Groupp1N</td>
<td>Groupp2N</td>
<td>PPV</td>
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<tr>
<td>Calfee,R.P., 2012 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Median Nerve Digit Score (MNDS); Index finger)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Motor Latency (DML))</td>
<td>84</td>
<td>index neg; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Motor Latency (DML))</td>
<td>135</td>
<td>0.33</td>
<td>0.83</td>
</tr>
<tr>
<td>Calfee,R.P., 2012 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Median Nerve Digit Score (MNDS); Long finger)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Motor Latency (DML))</td>
<td>93</td>
<td>index neg; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Motor Latency (DML))</td>
<td>126</td>
<td>0.37</td>
<td>0.87</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Grou p2 N</td>
<td>PPV</td>
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<td>Calfee,R.P., 2012 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Median Nerve Digit Score (MNDS); Thumb)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Motor Latency (DML))</td>
<td>57</td>
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<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Sensory Latency (DSL))</td>
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<td>index neg; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Sensory Latency (DSL))</td>
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<td>Outcomes Reported By</td>
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<td>Group2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Grou p2 N</td>
<td>PPV</td>
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<td>CTS Positive (Median Nerve Digit Score (MNDS); 2 digits)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Sensory Latency (DSL))</td>
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<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
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<td>80</td>
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<td>0.55</td>
<td>0.7 3</td>
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<td>Outcome (Index Test)</td>
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<td>CTS suspects with hand symptoms from a group of workers</td>
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<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Distal Sensory Latency (DSL))</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
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<td>Group2 (Reference Standard)</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Median-Ulnar Sensory Difference (MUD))</td>
<td>57</td>
<td>index neg; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Median-Ulnar Sensory Difference (MUD))</td>
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<td>CTS Positive (Median Nerve Digit Score (MNDS); 2 digits)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Median-Ulnar Sensory Difference (MUD))</td>
<td>77</td>
<td>index neg; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Median-Ulnar Sensory Difference (MUD))</td>
<td>136</td>
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<td>Threshold Notes</td>
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<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Rule In Test</td>
<td>Rule Out Test</td>
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<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
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<td>0.53</td>
<td>0.7 7</td>
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<td>Calfee,R.P., 2012 (3)</td>
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<td>CTS Positive (Median Nerve Digit Score (MNDS); Long finger)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Median-Ulnar Sensory Difference (MUD))</td>
<td>91</td>
<td>index neg; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Median-Ulnar Sensory Difference (MUD))</td>
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<td>0.8 0</td>
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<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
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<td>Calfee, R.P., 2012 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Median Nerve Digit Score (MNDS); Thumb)</td>
<td>CTS suspects with hand symptoms from a group of workers</td>
<td>Subjects</td>
<td>index pos; katz; MNDS total, long, index, thumb (Nerve Conduction Studies (NCS); Median-Ulnar Sensory Difference (MUD))</td>
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<td>Cartwright, M.S., 2013 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>Latino manual workers community sampled from 4 counties</td>
<td>Subjects</td>
<td>index pos; katz (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
<td>34</td>
<td>index neg; katz (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
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<td>Latino manual workers community sampled from 4 counties</td>
<td>Subjects</td>
<td>index pos; katz (Nerve Conduction Studies (NCS); &gt;.6ms)</td>
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<td>index neg; katz (Nerve Conduction Studies (NCS); &gt;.6ms)</td>
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<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>Latino manual workers community sampled from 4 counties</td>
<td>Subjects</td>
<td>index pos; katz (Nerve Conduction Studies (NCS); &gt;.8ms)</td>
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<td>index neg; katz (Nerve Conduction Studies (NCS); &gt;.8ms)</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Group2 N</td>
<td>PPV</td>
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<td>Dale, A.M., 2011</td>
<td>Moderate</td>
<td>CTS Positive</td>
<td>1108 recruits from 11 occupations of potential CTS risk</td>
<td>sensory, motor, and MUDS cutoffs</td>
<td>Extremities</td>
<td>index pos; katz (Nerve Conduction Studies (NCS))</td>
<td>index neg; katz (Nerve Conduction Studies (NCS))</td>
<td>62</td>
<td>2154</td>
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<td>Dhong, E.S., 2000</td>
<td>Moderate</td>
<td>CTS Positive</td>
<td>138 patients; 95% housewives who failed splint treatment and had clinical diagnosis</td>
<td>sensory latency and amplitude</td>
<td>Extremities</td>
<td>index pos; BCTQ FSS, SSS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; 0 INDEX NEG CASES; BCTQ FSS, SSS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>222</td>
<td>0</td>
<td>0.93</td>
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<tr>
<td>Dhong, E.S., 2000</td>
<td>Moderate</td>
<td>CTS Positive</td>
<td>138 patients; 95% housewives who failed splint treatment and had clinical diagnosis</td>
<td>sensory latency and amplitude</td>
<td>Extremities</td>
<td>index pos; BCTQ FSS, SSS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; 0 INDEX NEG CASES; BCTQ FSS, SSS (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>222</td>
<td>0</td>
<td>0.93</td>
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<td>Fowler, J.R., 2014</td>
<td>Moderate</td>
<td>CTS Positive</td>
<td>referred to EDS; 80 percent prob; score of 12+</td>
<td>Subjects</td>
<td>index pos; CTS 6 stringent (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; CTS 6 stringent (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>55</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>Groupp1 N</td>
<td>Groupp2 N</td>
<td>PPV</td>
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<tr>
<td>Franzblau,A., 1994 (1) Moderate Quality CTS Positive (Modified Katz Hand Diagram; classic) 408 at risk workers from various facilities median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms Extremities index pos; modified katz variations (Nerve Conduction Studies (NCS); &gt;.8ms) 59 index neg; modified katz variations (Nerve Conduction Studies (NCS); &gt;.8ms) 757 0.27</td>
<td>0.8 3 0.11</td>
<td>0.9 4 1.75</td>
<td>0.9 5 POOR POOR</td>
<td></td>
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<td>Franzblau,A., 1994 (1) Moderate Quality CTS Positive (Modified Katz Hand Diagram; classic or probable) 408 at risk workers from various facilities median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms Extremities index pos; modified katz variations (Nerve Conduction Studies (NCS); &gt;.8ms) 91 index neg; modified katz variations (Nerve Conduction Studies (NCS); &gt;.8ms) 725 0.21</td>
<td>0.8 3 0.13</td>
<td>0.8 9 1.24</td>
<td>0.9 7 POOR POOR</td>
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<td>Franzblau,A., 1994 (1) Moderate Quality CTS Positive (Modified Katz Hand Diagram; classic, probable, or possible) 408 at risk workers from various facilities median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms Extremities index pos; modified katz variations (Nerve Conduction Studies (NCS); &gt;.8ms) 159 index neg; modified katz variations (Nerve Conduction Studies (NCS); &gt;.8ms) 657 0.16</td>
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<td>0.8 0 0.88</td>
<td>1.0 3 POOR POOR</td>
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<td>Franzblau,A., 1994 (2) Moderate Quality CTS Positive (Modified Katz Hand Diagram; classic) 408 at risk workers from various facilities median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms Extremities index pos; modified Katz variations (Nerve Conduction Studies (NCS); &gt;.5ms) 59 index neg; modified Katz variations (Nerve Conduction Studies (NCS); &gt;.5ms) 757 0.42</td>
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<td>0.8 7 WEAK POOR</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p2 N</td>
<td>PPV</td>
<td>NP V</td>
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<td>Franzblau, A., 1994 (2)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Modified Katz Hand Diagram; classic or probable)</td>
<td>408 at risk workers from various facilities</td>
<td>median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms</td>
<td>Extremities</td>
<td>index pos; modified Katz variations (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
<td>index neg; modified Katz variations (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
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<td>Franzblau, A., 1994 (2)</td>
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<td>CTS Positive (Modified Katz Hand Diagram; classic, probable, or possible)</td>
<td>408 at risk workers from various facilities</td>
<td>median to ulnar sensory peak latency of &gt;.8ms or &gt;.5ms</td>
<td>Extremities</td>
<td>index pos; modified Katz variations (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
<td>index neg; modified Katz variations (Nerve Conduction Studies (NCS); &gt;.5ms)</td>
<td>159</td>
<td>657</td>
<td>0.28</td>
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<td>Gomes,I., 2006</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>2535 patients referred for NCS from 5 facilities</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Extremities</td>
<td>index pos; katz (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; katz (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>1471</td>
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<td>Hems,T.E., 2009</td>
<td>Moderate Quality</td>
<td>CTS Positive (Bland Questionnaire; 6+)</td>
<td>group of patients with clinically unconfirmed CTS among a group of suspected patients</td>
<td>motor and sensory latency cutoffs</td>
<td>Subjects</td>
<td>index pos; Bland Questionnaire (Nerve Conduction Studies (NCS))</td>
<td>index neg; Bland Questionnaire (Nerve Conduction Studies (NCS))</td>
<td>74</td>
<td>17</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>PPV</td>
<td>NPV</td>
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<td>Hems,T.E., 2009 Moderate Quality</td>
<td>CTS Positive (Bland Questionnaire; 7+)</td>
<td>group of patients with clinically unconfirmed CTS among a group of suspected patients</td>
<td>motor and sensory latency cutoffs</td>
<td>Subjects</td>
<td>index pos; Bland Questionnaire (Nerve Conduction Studies (NCS))</td>
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<td>index neg; Bland Questionnaire (Nerve Conduction Studies (NCS))</td>
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<td>CTS Positive (Bland Questionnaire; 8+)</td>
<td>group of patients with clinically unconfirmed CTS among a group of suspected patients</td>
<td>motor and sensory latency cutoffs</td>
<td>Subjects</td>
<td>index pos; Bland Questionnaire (Nerve Conduction Studies (NCS))</td>
<td>57</td>
<td>index neg; Bland Questionnaire (Nerve Conduction Studies (NCS))</td>
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<td>0.91</td>
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<td>Hems,T.E., 2009 Moderate Quality</td>
<td>CTS Positive (Bland Questionnaire; Symptom Score Only; 6+)</td>
<td>group of patients with clinically unconfirmed CTS among a group of suspected patients</td>
<td>motor and sensory latency cutoffs</td>
<td>Subjects</td>
<td>index pos; Bland Questionnaire (Nerve Conduction Studies (NCS))</td>
<td>59</td>
<td>index neg; Bland Questionnaire (Nerve Conduction Studies (NCS))</td>
<td>32</td>
<td>0.88</td>
<td>0.34</td>
</tr>
<tr>
<td>Katz,J.N., 1990 (A) Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic)</td>
<td>63 random patients from a group with upper extremity symptoms</td>
<td>no threshold for NCS evidence; one clinical confirmati on (response to treatment)</td>
<td>Extremities</td>
<td>index pos; katz levels (Nerve Conduction Studies (NCS) and Clinical Diagnosis)</td>
<td>32</td>
<td>index neg; katz levels (Nerve Conduction Studies (NCS) and Clinical Diagnosis)</td>
<td>53</td>
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<td>Reference Title</td>
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<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>Groupl N</td>
<td>Group2 N</td>
<td>PPV</td>
</tr>
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<tr>
<td>Katz,J.N., 1990 (A)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>63 random patients from a group with upper extremity symptoms</td>
<td>no threshold for NCS evidence; one clinical confirmation (response to treatment)</td>
<td>Extremities</td>
<td>index pos; katz levels (Nerve Conduction Studies (NCS) and Clinical Diagnosis)</td>
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<td>63 random patients from a group with upper extremity symptoms</td>
<td>no threshold for NCS evidence; one clinical confirmation (response to treatment)</td>
<td>Extremities</td>
<td>index pos; katz levels (Nerve Conduction Studies (NCS) and Clinical Diagnosis)</td>
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<td>6</td>
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<td>Moderate Quality</td>
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<td>CTS symptomatic subjects at one hospital</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Subjects</td>
<td>index pos; katz; niosh case definition (Nerve Conduction Studies (NCS))</td>
<td>index neg; katz; niosh case definition (Nerve Conduction Studies (NCS))</td>
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<td>14</td>
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<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NP</td>
<td>Sens</td>
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<tr>
<td>Katz,J.N., 1991</td>
<td>Moderate Quality</td>
<td>CTS Positive (NIOSH Case Definition; symptoms, work relatedness, objective evidence)</td>
<td>CTS symptomatic subjects at one hospital</td>
<td>sensory, motor, and mixed nerve cutoffs</td>
<td>Subjects</td>
<td>index pos; katz; niosh case definition (Nerve Conduction Studies (NCS))</td>
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<td>Kuhlman,K. A., 1997</td>
<td>Moderate Quality</td>
<td>CTS Positive (Wrist Ratio)</td>
<td>143 clinical CTS suspects</td>
<td>referenced sensory and motor cutoffs</td>
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<td>index pos; wrist ratio (Nerve Conduction Studies (NCS))</td>
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<td>121</td>
<td>107</td>
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<td>Makanji,H.S., 2014</td>
<td>Moderate Quality</td>
<td>CTS Positive (CTS-6; Lax; 50+%)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>index pos; CTS 6 lax, stringent (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>11</td>
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<td>Moderate Quality</td>
<td>CTS Positive (CTS-6; Stringent; 80+%)</td>
<td>referred CTS suspects</td>
<td>DML and DSL with referenced normal values</td>
<td>index pos; CTS 6 lax, stringent (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Patient Characteristics</td>
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<td>Group2 (Reference Standard)</td>
<td>Group1 N</td>
<td>Group2 N</td>
<td>PPV</td>
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<td>Padua,L., 1999</td>
<td>Moderate Quality</td>
<td>CTS Positive (Modified Hi-Ob Scale; Pain)</td>
<td>clinically suspected idiopathic CTS patients</td>
<td>clinical and NCS from AANEM considered; min of clinical diagnosis and various severities of NCS testing results</td>
<td>Extremities</td>
<td>index pos; Modified Hi-Ob Scale; Pain (Nerve Conduction Studies (NCS) and clinical diagnosis; AANEM referenced)</td>
<td>index neg; Modified Hi-Ob Scale; Pain (Nerve Conduction Studies (NCS) and clinical diagnosis; AANEM referenced)</td>
<td>623</td>
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<td>0.95</td>
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<td>Stevens,J.C., 1997 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hand Symptom Diagram (HSD) and Hand Symptom Questionnaire (HSQ); Examiner 1)</td>
<td>100 CTS diagnosed patients and 50 with upper extremity problems other than CTS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
<td>index neg; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
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<tr>
<td>Stevens,J.C., 1997 (1)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hand Symptom Diagram (HSD); Examiner 1)</td>
<td>100 CTS diagnosed patients and 50 with upper extremity problems other than CTS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
<td>index neg; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
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<td>116</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Group2 (Reference Standard)</td>
<td>PPV</td>
<td>NP V</td>
<td>Sens</td>
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<td>Stevens,J.C., 1997 (1)</td>
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<td>100 CTS diagnosed patients and 50 with upper extremity problems other than CTS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
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<td>Stevens,J.C., 1997 (2)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hand Symptom Diagram (HSD) and Hand Symptom Questionnaire (HSQ); Examiner 2)</td>
<td>100 CTS diagnosed patients and 50 with upper extremity problems other than CTS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
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<tr>
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<td>Moderate Quality</td>
<td>CTS Positive (Hand Symptom Diagram (HSD); Examiner 2)</td>
<td>100 CTS diagnosed patients and 50 with upper extremity problems other than CTS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
<td>161</td>
<td>66</td>
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<td>0.5</td>
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<tr>
<td>Stevens,J.C., 1997 (2)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hand Symptom Questionnaire (HSQ); Examiner 2)</td>
<td>100 CTS diagnosed patients and 50 with upper extremity problems other than CTS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
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<td>59</td>
<td>0.78</td>
<td>0.5</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group 1 (Reference Standard)</td>
<td>Group 2 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Grou p2 N</td>
<td>PPV</td>
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<tr>
<td>Stevens,J.C., 1997 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hand Symptom Diagram (HSD) and Hand Symptom Questionnaire (HSQ); Examiner 3)</td>
<td>100 CTS diagnosed patients and 50 with upper extremity problems other than CTS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
<td>index neg; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
<td>149</td>
<td>78</td>
<td>0.85</td>
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<tr>
<td>Stevens,J.C., 1997 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hand Symptom Diagram (HSD); Examiner 3)</td>
<td>100 CTS diagnosed patients and 50 with upper extremity problems other than CTS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
<td>index neg; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
<td>138</td>
<td>89</td>
<td>0.85</td>
</tr>
<tr>
<td>Stevens,J.C., 1997 (3)</td>
<td>Moderate Quality</td>
<td>CTS Positive (Hand Symptom Questionnaire (HSQ); Examiner 3)</td>
<td>100 CTS diagnosed patients and 50 with upper extremity problems other than CTS</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
<td>index neg; HSD; HSQ (Nerve Conduction Studies (NCS))</td>
<td>101</td>
<td>126</td>
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<tr>
<td>Yagci,I., 2010</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic)</td>
<td>DPN PATIENT POPULATION referred to EDS lab</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; katz; clinical diagnosis via lax katz (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>index neg; katz; clinical diagnosis via lax katz (Nerve Conduction Studies (NCS); AANEM referenced)</td>
<td>22</td>
<td>72</td>
<td>1.00</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome (Index Test)</td>
<td>Patient Characteristics</td>
<td>Threshold Notes</td>
<td>Outcomes Reported By</td>
<td>Group1 (Reference Standard)</td>
<td>Grou p1 N</td>
<td>Group2 (Reference Standard)</td>
<td>Grou p2 N</td>
<td>PPV</td>
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<tr>
<td>Yagci,I., 2010</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic or probable)</td>
<td>DPN PATIENT POPULATION referred to EDS lab</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
<td>Extremities</td>
<td>index pos; katz; clinical diagnosis via lax katz (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>index neg; katz; clinical diagnosis via lax katz (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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<td>Yagci,I., 2010</td>
<td>Moderate Quality</td>
<td>CTS Positive (Katz Hand Diagram; classic, probable, and possible)</td>
<td>DPN PATIENT POPULATION referred to EDS lab</td>
<td>motor, mixed, sensory nerve cutoffs referenced</td>
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<td>index pos; katz; clinical diagnosis via lax katz (Nerve Conduction Studies (NCS); AANEM referenced)</td>
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### TABLE 28: LOW QUALITY STUDIES- PICO 4 (DIAGNOSTIC SCALES VERSUS REFERENCE STANDARD)

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome (Index Test)</th>
<th>Patient Characteristics</th>
<th>Threshold Notes</th>
<th>Outcomes Reported By</th>
<th>Group1 N</th>
<th>Group2 N</th>
<th>PPV/NPV</th>
<th>Sens/Spec</th>
<th>LR+/LR-</th>
<th>Rule In Test</th>
<th>Rule Out Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bland, J.D., 2014</td>
<td>Low Quality</td>
<td>CTS Positive (CTS Web Questionnaire; 40+ score)</td>
<td>all neurology referred patients who completed the web questionnaire</td>
<td>NCS graded on Canterbury severity scale</td>
<td>Subjects</td>
<td>1430</td>
<td>1225</td>
<td>0.78/0.68</td>
<td>0.74/0.73</td>
<td>2.71/0.36</td>
<td>WEAK</td>
<td>WEAK</td>
</tr>
</tbody>
</table>
META-ANALYSES

FIGURE 9: GENERAL EDS VERSUS KATZ HAND DIAGRAM (CLASSIC OR PROBABLE)

| Bivariate          | Coef  | Std. Err | z     | P>|z|  | [95% Conf.]        |
|--------------------|-------|----------|-------|------|------------------|
| E(logitSe)         | -0.2659417 | 0.4716623    | -1.190383 |
| E(logitSp)         | 1.409396  | 0.3899879    | 0.6450337 |
| Var(logitSe)       | 2.130157  | 1.0239388    | 0.8303295 |
| Var(logitSp)       | 1.453846  | 0.6875566    | 0.5753951 |
| Corr(logits)       | -1     | .          | .     | .    |                  |

<table>
<thead>
<tr>
<th>HSROC</th>
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<td>Lambda</td>
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<td>0.7098261</td>
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Summary pt.
| Se  | 0.4339037  | 0.115855    | 0.2331905 |
| Sp  | 0.8036706  | 0.0615393   | 0.6558904 |
| DOR | 3.137587   | 0.701593    | 2.339082 |
| LR+ | 2.21008    | 0.2135354   | 1.828799 |
| LR- | 0.7043885  | 0.0938493   | 0.5425032 |
| 1/LR-| 1.4196716 | 0.18915    | 1.093397 |

Covariance between estimates of E(logitSe) & E(logitSp) - 0.1760508
FIGURE 10: EDS AANEM VERSUS KATZ HAND DIAGRAM (CLASSIC OR PROBABLE)

<table>
<thead>
<tr>
<th>Study parameter</th>
<th>Se</th>
<th>Sp</th>
<th>DOR</th>
<th>LR+</th>
<th>LR-</th>
<th>1/LR-</th>
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<tr>
<td>E(logitSe)</td>
<td>1.404512</td>
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<td>-1.92377</td>
<td>1.295275</td>
<td>1.00951</td>
<td>-0.791905</td>
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<tr>
<td>E(logitSp)</td>
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<td>1.061397</td>
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<td>.546547</td>
<td>.25952</td>
<td>-1.92377</td>
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<tr>
<td>Var(logitSe)</td>
<td>2.875086</td>
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<td>.546547</td>
<td>.349547</td>
<td>.25952</td>
<td>-1.92377</td>
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<tr>
<td>Var(logitSp)</td>
<td>5.116747</td>
<td>4.237196</td>
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<td>.349547</td>
<td>.25952</td>
<td>-1.92377</td>
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<tr>
<td>Corr(logits)</td>
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Meta-analysis of diagnostic accuracy

Log likelihood = -46.077342

Number of studies

| Bivariate       | Coef.  | Std. Err. | z      | P>|z| | 95% Conf |
|-----------------|--------|-----------|--------|------|----------|
| E(logitSe)      | 1.404512 | .8147543 | -.192377 | 1.295275 | 1.00951 | -0.791905 |
| E(logitSp)      | .7850249 | 1.061397 | -.192377 | 1.295275 | 1.00951 | -0.791905 |
| Var(logitSe)    | 2.875086 | 2.435385 | -.192377 | 1.295275 | 1.00951 | -0.791905 |
| Var(logitSp)    | 5.116747 | 4.237196 | -.192377 | 1.295275 | 1.00951 | -0.791905 |
| Corr(logits)    | -.1592222 | .455467 | -.192377 | 1.295275 | 1.00951 | -0.791905 |
| HSROC           |        |          |        |      |          |          |
| Lambda          | 2.301895 | 1.243203 | -.134738 |         |         |          |
| Theta           | .4712781 | .7229318 | -.945642 |         |         |          |
| Beta            | .2882182 | .5871028 | .812482  |         |         |          |
| s2alpha         | .449612  | 4.989029 | .141605  |         |         |          |
| s2theta         | 2.2231   | 1.647305 | .5202634 |         |         |          |

Covariance between estimates of E(logitSe) & E(logitSp) = -.121785

Study estimate
Summary point
HSROC curve
95% confidence region
95% prediction region
RISK FACTOR GUIDELINE RECOMMENDATIONS

INCREASED RISK OF CTS

A. Strong evidence supports that BMI and high hand/wrist repetition rate are associated with the increased risk of developing carpal tunnel syndrome (CTS).

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.

B. Moderate evidence supports that the following factors are associated with the increased risk of developing carpal tunnel syndrome (CTS):
   - Peri-menopausal
   - Wrist Ratio/Index
   - Rheumatoid Arthritis
   - Psychosocial factors
   - Distal upper extremity tendinopathies
   - Gardening
   - ACGIH Hand Activity Level at or above threshold
   - Assembly line work
   - Computer work
   - Vibration
   - Tendonitis
   - Workplace forceful grip/exertion

Strength of Recommendation: Moderate Evidence ★★★★★

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

C. Limited evidence supports that the following factors are associated with the increased risk of developing carpal tunnel syndrome (CTS):
   - Dialysis
   - Fibromyalgia
   - Varicosis
   - Distal radius fracture

Strength of Recommendation: Limited Evidence ★★★★
Rationale

BMI evaluated as a continuous variable was shown to be associated with development of CTS in four high quality (Armstrong, 2008; Bonfiglioli, 2013; Evanoff, 2014; Garg, 2012) and three moderate quality studies (Burt, 2011; Hlebs, 2014; Nordstrom, 1997). Only one moderate quality study (Goodson, 2014) found an insignificant result for the relationship between BMI and CTS. When evaluated as a categorical variable, five moderate quality studies (Becker, 2002; Burt, 2011; Burt, 2013; Coggon, 2013; Geoghegan, 2004) found a correlation between increasing BMI and development of CTS, while one high quality study (Hakim, 2002) and two moderate quality (Mondelli, 2006; Violante, 2007) studies found no significance.

High hand/wrist repetition rate at work was significantly associated to an increased risk of CTS by two high quality (Armstrong, 2008; Evanoff, 2014) and four moderate quality studies (Chiang, 1990; Coggon, 2013; Goodson, 2014; Silverstein, 1987). In all studies, the hand/wrist repetition involved moderate to high hand forces. One of the high quality studies (Armstrong, 2008) showed an insignificant association in two of the categories of repetition, but still showed a significant increase between the high and low quartile categories.

Peri-menopausal status was shown in one high quality study (Hakim, 2002) to be associated with an increased risk of CTS development, but no association was found between CTS and post-menopausal status.

Wrist ratio/index (ratio of wrist depth to width >0.7mm) was significantly associated with an increased risk of CTS in one high (Armstrong, 2008) and six moderate quality studies (Boz, 2004; Gordon, 1988; Hlebs, 2014; Moghtaderi, 2005; Sabry, 2009; Shariff-Mollayousefi, 2008).

Rheumatoid arthritis was associated with an increased risk of CTS in one high quality (Garg, 2012) and one moderate quality study (Burt, 2011). One moderate quality study (Geoghegan, 2004) showed an association between osteoarthritis and CTS.

Mood (“felt down, blue or depressed always/never, compared to seldom”) was associated with increased risk of CTS in one high quality study (Garg, 2012). One moderate quality study (Coggon, 2013) showed an association with increased risk based on self-rated mental health.

Hand, wrist or elbow tendinopathies (musculoskeletal conditions) were associated with increased risk of CTS in one high quality (Garg, 2012) and two moderate quality studies (Aktas, 2008; Nordstrom, 1997).

Gardening was associated with an increased risk of developing CTS in one high quality study (Garg, 2012).

The American Conference of Governmental Industrial Hygienists (ACGIH) hand activity level (HAL) is a standardized method for evaluating jobs that involves expert observation, direct measurement or video analysis to assess both pinch/grip force and hand/wrist repetition rate. There was one high quality (Bonfiglioli, 2013) and three moderate quality (Burt, 2011; Burt, 2013; Violante, 2007) studies, showing significant associations to increased risk of CTS when the ACGIH HAL was at or above the threshold limit. In addition, there was one high quality study (Garg, 2012) that showed an association with CTS by hazard ratio but this finding was limited by a wide confidence interval that included a value of 1.0 (HR: 2.01, CI: 0.8-5.0).
Assembly line work was associated with increased risk for the development of CTS in one high quality (Armstrong, 2008) and two low quality studies (Bonfiglioli, 2006; Lecler, 1998).

Computer work was significantly associated with increased risk of CTS by three moderate quality studies (Ali, 2006; Coggon, 2013; Eleftheriou, 2012). One study found an increased association with an average of greater than eight hours of computer use per day and more than four years of computer work (Ali, 2006). Another study found an association between an increased risk of CTS and working on a keyboard or mouse for more than four hours per day (Coggon, 2013). The third study found an association with a very high number of keystrokes typed per year and a higher risk of CTS (Eleftheriou, 2012). There was one moderate quality study (Ali, 2006) evaluating internet use for leisure, which also found a significant result for increasing risk of CTS.

The use of vibrating hand-held tools was associated with an increased risk of CTS in one high quality (Armstrong, 2008) and three moderate quality studies (Coggon, 2013; Dale, 2014; Nordstrom, 1997).

Tendonitis in the shoulder, hand, finger, or wrist was shown to increase risk of CTS by one high quality (Armstrong, 2008) and one low quality study (Werner, 2005).

Workplace forceful grip/exertion was found to be significantly associated with increased risk of CTS by one high quality (Armstrong, 2008) and four moderate quality studies (Burt, 2011; Burt, 2013; Dale, 2014; Evanoff, 2012).

Comorbidities including dialysis, fibromyalgia, and varicosity each had one moderate quality study (Shin, 2008; Fahmi, 2013; De Krom, 1990) showing that each has a significantly increased risk of CTS.

Wrist fracture showed an increased risk of CTS in two moderate quality studies (Geoghegan, 2004; Dyer, 2008). One moderate quality study (Morgenstern, 1991) showed an insignificant relationship, but that study included only female participants and therefore the findings may not be generalizable.

**Risks and Harms of Implementing this Recommendation**

There are no known harms associated with implementing these recommendations.

**Future Research**

Studies should be conducted to identify objective methods for assessing workplace physical factors in order to improve the precision of risk estimation and improve confidence in thresholds of injury. Workplace intervention studies should be conducted to confirm that modifications in work activities may improve symptoms and functional deficits in workers with CTS. Studies of risk should include proper control for confounding as in a logistic regression analysis with appropriate population sizes and associated odds ratios.

**DECREASED RISK OF CTS**

Moderate evidence supports that physical activity/exercise is associated with a decreased risk of developing carpal tunnel syndrome (CTS).

**Strength of Recommendation: Moderate Evidence ★★★★ ★★★★ ★★★★ ★★★★
Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention

Rationale
Vigorous exercise was associated with reduced risk of CTS in one moderate quality study (Goodson, 2014). In the same study, increased risk of CTS was associated with wrist straining exercise (e.g., weight lifting, mountain biking, racquet sports), but that risk was reduced if there was also vigorous exercise. Another moderate quality study (Eleftheriou, 2012) found an association between regular physical activity (e.g., basketball, football, tennis, jogging, and swimming) and reduced risk of CTS.

Risks and Harms of Implementing this Recommendation
There are no known harms associated with implementing these recommendations.

Future Research
The moderate quality studies finding that found a reduction in risk for CTS with vigorous exercise are intriguing. There should be additional research to confirm these findings and identify the specific types and amount of exercise that may be effective. There should be studies to investigate apportionment of risk between personal and workplace factors.

FACTORS SHOWING NO ASSOCIATED RISK OF CTS

A. Moderate evidence supports that the use of oral contraception and female hormone replacement therapy (HRT) are not associated with increased or decreased risk of developing carpal tunnel syndrome (CTS).

Strength of Recommendation: Moderate Evidence ★★★

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

B. Limited evidence supports that race/ethnicity and female education level are not associated with increased or decreased risk of developing carpal tunnel syndrome (CTS).

Strength of Recommendation: Limited Evidence ★★

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

Rationale
Oral contraception use among females was shown to have no significant relationship to the development of CTS in three moderate quality studies (Geoghehan, 2004; Mondelli, 2006; Morgenstern, 1991). Oral HRT use among females was shown to have no significant relationship to the development of CTS in one high quality and one moderate quality study (Hakim, 2002; Geoghehan, 2004). Education level among females showed no significant relationship to the development of CTS in one moderate quality (Bonfiglioli, 2007) and two low quality studies (Kaplan, 2008; Wright, 2014). Race/ethnicity showed no significant relationship to the development of CTS in one moderate quality study (Nathan, 2002).
**Risks and Harms of Implementing this Recommendation**
There are no known harms associated with implementing these recommendations.

**Future Research**
The moderate quality studies finding that found a reduction in risk for CTS with vigorous exercise are intriguing. There should be additional research to confirm these findings and identify the specific types and amount of exercise that may be effective. There should be studies to investigate apportionment of risk between personal and workplace factors. Studies should be conducted to identify objective methods for assessing workplace physical factors in order to improve the precision of risk estimation and improve confidence in thresholds of injury. Workplace intervention studies should be conducted to confirm that modifications in work activities may improve symptoms and functional deficits in workers with CTS. More research into the relationship between diabetes and CTS should be done, as the conflicting results indicate a possible association between these conditions. Studies of risk should include proper control for confounding as in a logistic regression analysis with appropriate population sizes and associated odds ratios.
FACTORS SHOWING CONFLICTING RISK OF CTS

Limited evidence supports that the following factors have conflicting results regarding the development of carpal tunnel syndrome (CTS):

- Diabetes
- Age
- Gender/Sex
- Genetics
- Comorbid drug use
- Smoking
- Wrist bending
- Workplace

Strength of Recommendation: Limited Evidence 🟢🟢🟢 ⭐

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

Rationale

Diabetes showed a conflicting relationship to CTS development. One high quality study (Armstrong, 2008) did not demonstrate a significant association with CTS. The odds ratio was elevated but there was a wide confidence interval that included a value of 1.0 (OR 2.45, CI: 0.92-6.53). Three moderate quality studies (Becker, 2002; Geoghegan, 2004; Plastino, 2011) found significant associations between diabetes and an increased risk of CTS and one (Coggon, 2013) did not find an association.

Age showed a conflicting relationship to CTS development. Two high quality studies (Armstrong, 2008; Bonfiglioli, 2013) showed increased risk in older workers on a continuous scale. Two other high quality studies (Evanoff, 2014; Garg, 2012) measuring age on a continuous scale showed insignificant results but with slightly increased risk ratios and narrow confidence limits. Two moderate quality studies (Morgenstern, 1991; Shin, 2008) also found a significantly increased risk of CTS when measuring age continuously and one moderate quality study (Silverstein, 1987) found an insignificant relationship. When measured categorically, one high quality study (Hakim, 2002) showed an increasing association at age >46 and one moderate quality study (Violante, 2007) found an increasing association among all categories. Two moderate quality studies (Eleftheriou, 2012; Mondelli, 2006) did not find a significant association between categories of age and CTS development.

Female gender/sex was associated with increased risk of CTS in one high quality (Bonfiglioli, 2013) and three moderate quality studies (Burt, 2011; Eleftheriou, 2012; Violante, 2007), while two high quality (Armstrong, 2008; Evanoff, 2014) and two moderate quality studies (Shin, 2008; Silverstein, 1987) showed no significant association.

Family history/genetics was associated with increased risk of CTS in one high quality (Hakim, 2002) and two moderate quality studies (Bonfiglioli, 2007; Burt 2011), while two moderate quality studies (Nordstrom, 1997; Violante, 2007) showed no significant correlation. The studies used varying diagnostic methods, and two of the studies evaluated female populations, which may have contributed to the conflicting results.
Comorbid drug use showed a conflicting relationship to CTS development. One high quality study (Hakim, 2002) found no association with thyroxine replacement. One moderate quality study (Geoghegan, 2004) reported an increasing risk of CTS with insulin, sulphonyl, or thyroxine. Two moderate quality studies reported no association to CTS when using diuretics (Morgenstern, 1991) or metformin (Geoghegan, 2004).

Smoking had a conflicting relationship to CTS development. Two moderate quality studies (Eleftheriou, 2012; Violante, 2007) found an association of increasing risk, one moderate quality study (Coggon, 2013) found an inverse association, and one moderate quality study (Geoghegan, 2004) found no association.

Wrist bending had a conflicting relationship to CTS development. One high (Armstrong, 2008) and one moderate quality study (De Krom, 1990) showed an increased risk while two moderate quality studies (Dale, 2014; Evanoff, 2012) displayed an insignificant association. One moderate quality study (Nordstrom, 1997) showed an insignificant result with a short duration of wrist bending and an increased risk of CTS with more frequent wrist bending.

Many recent high and moderate quality studies were identified and provide new insights into workplace factors associated with CTS. However, the studies did not consider the relative contributions of personal and work-related factors on CTS, so it is difficult to calculate risk attributable to different risk factors from the data. Some occupational factors and workplace exposures were evaluated by single studies with weak designs or relatively weak exposure assessment methods. The findings from those studies, therefore, did not contribute to the conclusions. Workplace categories include: clerical/office work, industrial, construction, farming, hospital, professional, technical, managerial, sales, skilled trades (agriculture, fabrication, machining, transporter techs, electricians, plumbers, construction), and other jobs.

**Risks and Harms of Implementing this Recommendation**

There are no known risks or harms.

**Future Research**

There should be studies to investigate apportionment of risk between personal and workplace factors. Studies should be conducted to identify objective methods for assessing workplace physical factors in order to improve the precision of risk estimation and improve confidence in thresholds of injury. Workplace intervention studies should be conducted to confirm that modifications in work activities may improve symptoms and functional deficits in workers with CTS. More research into the relationship between diabetes and CTS should be done, as the conflicting results indicate a possible association between these conditions. Studies of risk should include proper control for confounding as in a logistic regression analysis with appropriate population sizes and associated odds ratios.
## Study Quality Tables for Risk Factor Recommendations

### Quality Table for Associated Risk Factors for CTS

#### Table 29. Prognostic Quality Evaluations

<table>
<thead>
<tr>
<th>Study</th>
<th>Representative Population</th>
<th>Reason for Follow Up Loss</th>
<th>Prognostic Factor Measured</th>
<th>Outcome Measurement</th>
<th>Confounders</th>
<th>Appropriate Statistical Analysis</th>
<th>Inclusion</th>
<th>Strength</th>
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<tr>
<td>Study</td>
<td>Representative Population</td>
<td>Reason for Follow Up Loss</td>
<td>Prognostic Factor Measured</td>
<td>Outcome Measurement</td>
<td>Confounders</td>
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<td>Inclusion</td>
<td>Strength</td>
</tr>
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<td>Roquelaure,Y., 2008</td>
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<td>Representative Population</td>
<td>Reason for Follow Up Loss</td>
<td>Prognostic Factor Measured</td>
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<td>Confounders</td>
<td>Appropriate Statistical Analysis</td>
<td>Inclusion</td>
<td>Strength</td>
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<td>Shin,J., 2008</td>
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<td>Tsai,N.W., 2013</td>
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<td>Violante,F.S., 2007</td>
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<td>Vogelsang,L.M., 1994</td>
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<td>Werner,R.A., 2005</td>
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<td>Wolf,J.M., 2009</td>
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<tr>
<td>Wright,C., 2014</td>
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<td>Moderate Quality</td>
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<td>Yagev,Y., 2001</td>
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<td></td>
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<td>Include</td>
<td>Low Quality</td>
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</table>
**RESULTS**

**SUMMARY OF DATA FINDINGS**

**TABLE 30: SUMMARY OF FINDINGS - FEMALE GENDER/SEX RELATED RISK FACTORS**

<table>
<thead>
<tr>
<th>Female Gender/Sex Related Risk Factors</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal pre-pregnancy BMI with excessive gestational weight gain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese pre-pregnancy with excessive gestational weight gain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overweight pre-pregnancy with excessive gestational weight gain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contraception</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRT use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysterectomy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysterectomy vs premenopausal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysterectomy vs menopause more than 5 years ago</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hysterectomy after controlling for menopause</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of pregnancies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of prenatal care visits</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Perimenopause</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Post-menopause</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time since menopause</td>
<td></td>
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</tbody>
</table>

- Increases Odds
- Decreases Odds
- Not Significant

*Quality levels: Low Quality, Moderate Quality, High Quality*
<table>
<thead>
<tr>
<th>Job Related Risk Factors</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH Hand Activity between action limit and threshold limit value</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ACGIH Hand Activity level above threshold limit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACGIH above threshold limit value (TLV) versus at or below acceptable limit</td>
<td>▲</td>
<td>◀</td>
<td>◀</td>
</tr>
<tr>
<td>ACGIH HAL above TLV vs acceptable level or below</td>
<td>◀</td>
<td>◀</td>
<td>♦</td>
</tr>
<tr>
<td>Biomechanical load above threshold limit value versus below action limit</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Previous exposure to biomechanical overload</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold limit ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold limit value and above vs below action limit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assembly Line</td>
<td>▲</td>
<td>◀</td>
<td>♦</td>
</tr>
<tr>
<td>Automatic work pace</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemicals</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Contact with solvents 0.08-0.75 hours/day vs none</td>
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<td></td>
<td>◀</td>
</tr>
<tr>
<td>Contact with solvents 1-11 hours/day vs none</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Clerical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative/secretarial jobs vs. Associate professional/technical jobs</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Matched all females</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Matched all males</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cold Exposure</td>
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</tr>
<tr>
<td>Computer Work</td>
<td></td>
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</tr>
<tr>
<td>Construction Work</td>
<td>▲</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dexterity (ONET)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Dexterity derived from factor analysis 4th vs 1st quartile</td>
<td>▲</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dexterity derived from factor analysis 2nd vs 1st quartile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dexterity derived from factor analysis 3rd vs 1st quartile</td>
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<tr>
<td>Dynamic Strength (ONET)</td>
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</tr>
<tr>
<td>Exertion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exerts/min cat 2 versus 1 if BMI&lt;30</td>
<td></td>
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<td></td>
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<tr>
<td>Exerts/min cat 2 versus 1 if BMI&gt;=30</td>
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<td></td>
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<tr>
<td>Exerts/min cat 3 versus 1 if BMI&lt;30</td>
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<td></td>
</tr>
<tr>
<td>Exerts/min cat 3 versus 1 if BMI&gt;=30</td>
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<tr>
<td>Peak worker perceived exertion rating (0-10)</td>
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<tr>
<td>Time in forceful exertion between 20 and 60% vs &lt;20%</td>
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</tr>
<tr>
<td>Time in forceful exertion between greater than 60% vs &lt;20%</td>
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<tr>
<td>Farming</td>
<td></td>
<td></td>
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<tr>
<td>Finger pinch grip</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td></td>
<td></td>
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<tr>
<td>Forceful gripping in most recent job</td>
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</tr>
<tr>
<td>Peak force match cat 2 versus 1</td>
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</tr>
<tr>
<td>Peak force match cat 3 versus 1</td>
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<tr>
<td>Peak force, unitary increase (1-7)</td>
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<tr>
<td>Upper extremity force derived from factor analysis 2nd quartile vs 1st quartile</td>
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<tr>
<td>Upper extremity force derived from factor analysis 3rd quartile vs 1st quartile</td>
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<tr>
<td>Forearm Rotation</td>
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<td>Grip</td>
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<tr>
<td>Hospital Work vs Clerical</td>
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<tr>
<td>Industrial (blue collar, process, plant, machine, clothing, and shoe industries)</td>
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<tr>
<td>Blue collar, process, plant, machine, clothing, and shoe industries</td>
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<tr>
<td>Job Strain</td>
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<tr>
<td>Strain index above 6.1 vs less than or equal to 6.1</td>
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</table>
### TABLE 32: SUMMARY OF FINDINGS - JOB RELATED FACTORS CONT’D

<table>
<thead>
<tr>
<th>Job Related Risk Factors</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
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<tbody>
<tr>
<td>Increases Odds</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Decreases Odds</td>
<td></td>
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</tr>
<tr>
<td>Not Significant</td>
<td></td>
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</tr>
</tbody>
</table>

#### Level of Job Control
- IOSH Job control (0=least) 2.8-3.4 vs 1-2.7
- IOSH Job control (0=least) 3.6-3.8 vs 1-2.7
- IOSH Job control (0=least) 4.6-4.8 vs 1-2.7
- IOSH Job control (0=least) 4-4.4 vs 1-2.7

#### Level of Satisfaction
- Lifting
- Managerial Jobs
- Military Rank
- Office Work
- Lower-grade white-collar workers vs unemployed (Among men, Among women)
- Elementary occupations versus technical/professional
- Home maker vs employed
- Poultry work
- System Administrator vs other computer jobs

#### Other Jobs
- Craftswomen/sales/clerical versus unemployed
- Other jobs
- Skilled Trades vs Unemployed
- Professional jobs vs. Associate professional/technical jobs
- Repetition
- Sales
- Service Occupations
- Skilled Trades vs Unemployed

#### Repetition
- Practicing professionally for greater or equal to 5 years
- Professional jobs vs. Associate professional/technical jobs
- Professional jobs vs Unemployed
- Repetition
- Sales
- Service Occupations
- Skilled Trades vs Unemployed

#### Technical jobs vs Unemployed
- Vibration
- Work Length
- Wrist Bending
- Pressing with the thumb
- Professional jobs
- Practicing professionally for greater or equal to 5 years
- Professional jobs vs. Associate professional/technical jobs

#### Skilled Trades
- Static Strength (ONET)
- Technical jobs vs Unemployed
- Vibration
- Work Length
- Wrist Bending
- Pressing with the thumb
- Professional jobs
- Practicing professionally for greater or equal to 5 years
- Professional jobs vs. Associate professional/technical jobs

*Significance may conflict among Repetition categories
Ɨ Significance may conflict among Vibration categories
TABLE 33: SUMMARY OF FINDINGS- COMORBID DISEASE RISK FACTORS

<table>
<thead>
<tr>
<th>Comorbidity Risk Factors</th>
<th>Increases Odds</th>
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<tbody>
<tr>
<td>Any facilitating comorbidities</td>
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<tr>
<td>Arthritis</td>
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<tr>
<td>Comorbidity Drug Use</td>
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<tr>
<td>Corticosteroid</td>
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<tr>
<td>Current thyroid replacement therapy</td>
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<tr>
<td>Thyroxine</td>
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<tr>
<td>Diuretics</td>
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<tr>
<td>Diabetes</td>
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<tr>
<td>Diabetes</td>
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<td></td>
</tr>
<tr>
<td>Insulin use</td>
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<td>Metformin use</td>
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<td></td>
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<tr>
<td>Sulphonyl use</td>
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<td>Female gender/sex and diabetes interaction effect</td>
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<tr>
<td>Dialysis</td>
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<tr>
<td>Endocrine Condition</td>
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<tr>
<td>Fibromyalgia</td>
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<td>Fracture</td>
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<td>General Comorbidities</td>
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<tr>
<td>1 or more predisposing disease (female floor cleaners)</td>
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<tr>
<td>Bilateral agenesis vs none</td>
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<tr>
<td>High blood pressure vs no</td>
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<tr>
<td>Suspected Medical Risk factors related to cts</td>
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<tr>
<td>Presence of anti-HCV antibodies</td>
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<tr>
<td>Related Medical Conditions [RMC instrument]</td>
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<tr>
<td>TOS patients with fibrositis vs TOS patients without Fibrositis</td>
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<tr>
<td>TOS women who had miscarriages versus women with TOS who did not have a miscarriage</td>
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<tr>
<td>TOS women with fibrositis vs TOS women without Fibrositis</td>
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<tr>
<td>TOS with concomitant neuropathy vs TOS alone</td>
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<tr>
<td>TOS with concomitant scleroderma vs TOS alone</td>
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<tr>
<td>TOS with concomitant Thromboembolic events vs TOS alone</td>
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<tr>
<td>Unilateral agenesis vs none</td>
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<tr>
<td>Mental Health</td>
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<tr>
<td>Feeling down or blue or depressed always vs seldom</td>
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<tr>
<td>Feeling down or blue or depressed never vs seldom</td>
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<tr>
<td>Feeling down or blue or depressed often vs seldom</td>
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<tr>
<td>Intermediate mental health vs good mental health</td>
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<tr>
<td>Poor mental health vs good mental health</td>
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<tr>
<td>Psychological distress measured by General Health</td>
<td></td>
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</tr>
<tr>
<td>Questionnaire (GHQ-12) greater or equal to 90th percentile</td>
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<tr>
<td>Musculoskeletal Conditions</td>
<td></td>
<td></td>
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<tr>
<td>Paraplegic</td>
<td></td>
<td></td>
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<tr>
<td>Raynaud’s Syndrome</td>
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<tr>
<td>Tendonitis</td>
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<tr>
<td>Varicosis</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
</table>

Increases Odds ▲ Decreases Odds ▼ Not Significant ○
## TABLE 34: SUMMARY OF FINDINGS - DEMOGRAPHIC RISK FACTORS

<table>
<thead>
<tr>
<th>Demographic Risk Factors</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age continuous variable</td>
<td>▲</td>
<td>▲</td>
<td>▼</td>
</tr>
<tr>
<td>Age by category</td>
<td></td>
<td></td>
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<tr>
<td>BMI continuous variable</td>
<td>▲</td>
<td>▲</td>
<td>▼</td>
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<tr>
<td>BMI by category</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender/Sex Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender/Sex female vs male</td>
<td>▲</td>
<td>▲</td>
<td>▼</td>
</tr>
<tr>
<td>Gender/Sex female vs male at the mean hand activity level (Model 2)</td>
<td></td>
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</tr>
<tr>
<td>Gender/Sex female vs male at the mean hand activity level (Model 3)</td>
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<tr>
<td>Genetics</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CTS family history</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTS diagnosed by symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTS diagnosed by symptoms and EDS</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Hand Activity Level among females</td>
<td></td>
<td></td>
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<tr>
<td>Hand Activity Level among males</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monozygotic vs dizygotic twins (genetic risk of CTS)</td>
<td>▲</td>
<td></td>
<td></td>
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<tr>
<td>Height/forearm (tall with short forearms)</td>
<td></td>
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<td></td>
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<tr>
<td>Hobbies</td>
<td></td>
<td></td>
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<tr>
<td>Gardening</td>
<td></td>
<td></td>
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<tr>
<td>Internet use (leisure)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Hand-knitting/needlework</td>
<td></td>
<td></td>
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<tr>
<td>CTS diagnosed by symptoms</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CTS diagnosed by symptoms and EDS</td>
<td></td>
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<tr>
<td>Housework</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous duration of kneading or rolling dough per week</td>
<td></td>
<td></td>
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<tr>
<td>Kneading or rolling dough manually more than 2 hours per week</td>
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<tr>
<td>Continuous duration of washing clothes per week</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Washing clothes manually more than 2 hours per week</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Marital status</td>
<td></td>
<td></td>
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<tr>
<td>Moderate Alcohol Use</td>
<td></td>
<td></td>
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<tr>
<td>Physical activities/exercise involving wrist strain</td>
<td>▲</td>
<td></td>
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<tr>
<td>Physical Activity/Exercise</td>
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<td></td>
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<tr>
<td>Vigorous exercise</td>
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<tr>
<td>History of physical sports activity (yes vs no)</td>
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<tr>
<td>Race/Ethnicity (White versus non-white)</td>
<td>▲</td>
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<tr>
<td>SF-36 scores (better scores)</td>
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<tr>
<td>Slimming courses (yes vs. no)</td>
<td>▲</td>
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<tr>
<td>Smoking</td>
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<tr>
<td>Current smoker vs non smoker</td>
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<tr>
<td>Compared to healthy controls</td>
<td></td>
<td></td>
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<tr>
<td>Compared to negative patients</td>
<td></td>
<td></td>
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<tr>
<td>Ever smoked (yes vs no)</td>
<td></td>
<td></td>
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<tr>
<td>Ex-smoker vs non smoker</td>
<td></td>
<td></td>
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<tr>
<td>Symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 distressing sympt vs none in past week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 distressing sympt vs none in past week</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significance may conflict among age categories
Ɨ Significance may conflict among BMI categories
### TABLE 35: SUMMARY OF FINDINGS- ANTHROPOMETRIC MEASURE RISK FACTORS

<table>
<thead>
<tr>
<th>Anthropometric Risk Factors</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increases Odds</td>
<td>Armstrong, T. 2008</td>
<td></td>
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<tr>
<td></td>
<td>Moghtaderi, A. 2005</td>
<td>Sabry, M. M. 2009</td>
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<td></td>
<td>Kopec, J. 2011</td>
<td>Tsai, N. W. 2013</td>
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<tr>
<td></td>
<td>Werner, R.A. 2005</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Arm Length**
- **Cross Sectional Area of Median Nerve**
- **Digit Index**
- **Elbow Posture Rating**
- **Hand Length- Body Height ratio**
- **Hand Shape Index**
- **Location of AV fistula**
- **Overall anthropometric measures**
- **Shape Index**
- **Trunk Incline**
- **Wrist Circumference**
- **Wrist Deviation**
- **Wrist Extension**
- **Wrist Index**
- **Wrist Ratio**
- **Wrist-Palm-Ratio**

*Significant at digit index only for matched females; insignificant for matched male population*
**DETAILED DATA FINDINGS**

**TABLE 36 RISK FACTOR: ACGIH HAND ACTIVITY**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonfiglioli,R. 2013</td>
<td>High</td>
<td>N= 2492; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms at 3 years</td>
<td>ACGIH between acceptable level and threshold limit value versus at or below acceptable limit (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>2.43 (1.77, 3.33)</td>
<td>having rating between acceptable and threshold levels is associated with higher risk of symptoms</td>
<td></td>
</tr>
</tbody>
</table>

<p>| Bonfiglioli,R. 2013 | High    | N= 2492; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories | CTS symptoms at 3 years | ACGIH above threshold limit value versus at or below acceptable limit (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) | incident rate ratio from Poisson regression                                                                                   | 3.32 (2.34, 4.72) | having rating above threshold level is associated with higher risk of symptoms |</p>
<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonfiglioli, R. 2013</td>
<td>High</td>
<td>N= 2299; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms and NCS test at 3 years</td>
<td>ACGIH between acceptable level and threshold limit value versus at or below acceptable limit</td>
<td>sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>1.95 (1.21, 3.16)</td>
<td>having rating between acceptable and threshold levels is associated with higher risk of CTS</td>
</tr>
<tr>
<td>Bonfiglioli, R. 2013</td>
<td>High</td>
<td>N= 2299; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms and NCS test at 3 years</td>
<td>ACGIH above threshold limit value versus at or below acceptable limit</td>
<td>sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>2.70 (1.48, 4.91)</td>
<td>having rating above threshold level is associated with higher risk of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>ACGIH HAL between AL and TLV vs acceptable level or below</td>
<td>Model1: ACGIH Hand Activity Level (HAL) ,age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>1.44 (0.55–3.76)</td>
<td>NS</td>
</tr>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>ACGIH HAL above TLV vs acceptable level or below</td>
<td>Model1: ACGIH Hand Activity Level (HAL) ,age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>2.01 (0.80–5.04)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 455 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Between the action limit and the TLV vs below action limit</td>
<td>Model 3: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex female vs male at the mean hand activity level</td>
<td>logistic regression odds ratio</td>
<td>2.28 (0.58-8.88)</td>
<td>NS</td>
</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 455 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Threshold limit value and above vs below action limit</td>
<td>Model 3: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex female vs male at the mean hand activity level</td>
<td>logistic regression odds ratio</td>
<td>2.96 (1.51-5.80)</td>
<td>having a hand action level above the TLV increases CTS odds</td>
</tr>
<tr>
<td>Burt,S. 2013</td>
<td>Moderate</td>
<td>N= 347 ; workers from hospital, school bus manufacturing plant, and engine assembly plant</td>
<td>electrodiagnostic test, symptoms, hand diagram at 2 years</td>
<td>Threshold limit ratio</td>
<td>model 2: threshold limit value, BMI, Job strain</td>
<td>hazard ratios</td>
<td>1.4 (1.11, 1.78)</td>
<td>higher amount of time in spent threshold limit value is associated with higher risk of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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</tr>
<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>Biomechanical load between action limit and threshold limit value versus below action limit</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>1.5 (0.9 – 2.5)</td>
<td>NS</td>
</tr>
<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>Biomechanical load above threshold limit value versus below action limit</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>3.0 (2.0 – 4.5)</td>
<td>Biomechanical loads above the threshold limit value increases odds of CTS compared to biomechanical loads under the action limit</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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</tr>
<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>Previous exposure to biomechanical overload</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>1.4(9-2.1)</td>
<td>NS</td>
</tr>
</tbody>
</table>
### TABLE 37 RISK FACTOR: AGE

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong, T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, floor layers, sheet metal workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>Age per 10 year increase</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>1.58 (1.32, 1.89)</td>
<td>older have significantly higher odds of median neuropathy</td>
</tr>
<tr>
<td>Bonfiglioli, R. 2013</td>
<td>High</td>
<td>N= 2492; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms at 3 years</td>
<td>Age</td>
<td>sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>1.03 (1.02, 1.04)</td>
<td>older age increases CTS symptom risk</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<td>Bonfiglioli,R.</td>
<td>High</td>
<td>N= 2299 ; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms and NCS test at 3 years</td>
<td>Age</td>
<td>sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>1.06 (1.05, 1.08)</td>
<td>older age increases CTS risk</td>
</tr>
<tr>
<td>Evanoff,B.</td>
<td>High</td>
<td>711 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Age</td>
<td>adjusted for age, Gender/Sex, and BMI; past diagnosis of CTS or other upper extremity peripheral neuropathy, had a pacemaker or internal defibrillator, or were pregnant at the time of enrollment excluded</td>
<td>Multivariable mixed logistic regression models OR</td>
<td>1.03 (1.00-1.05)</td>
<td>NS</td>
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<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>Age</td>
<td>Model1: ACGIH Hand Activity Level (HAL) :age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>1.077 (.99,1.17)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<td>Garg, A. 2012</td>
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<td>N= 536; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>Age</td>
<td>Model 2: strain index, age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>1.076 (0.99–1.17)</td>
<td>NS</td>
</tr>
<tr>
<td>Hakim, A.J. 2002</td>
<td>High</td>
<td>N= 3674; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Age 46–50 vs Age 45 or below matched by: pairs of twins; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>2.01 (1.44–2.81)</td>
<td>age 46 to 50 has higher odds of CTS than 45 or younger</td>
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<tr>
<td>Hakim, A.J. 2002</td>
<td>High</td>
<td>N= 3674; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Age 51–55 vs Age 45 or below matched by: pairs of twins; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>1.3 (0.92–1.83)</td>
<td>NS</td>
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<td>Study</td>
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<td>Age 56–59 vs Age 45 or below</td>
<td>matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>1.33 (0.92–1.92)</td>
<td>NS</td>
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<tr>
<td>Hakim,A.J. 2002</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
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<td>Age 60 vs 45</td>
<td>matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>1.28 (0.94–1.75)</td>
<td>NS</td>
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<tr>
<td>Bland,J.D. 2005</td>
<td>Low</td>
<td>N= 4155 ; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>In age quintile 2 vs 1st Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>1.52 (0.53,4.39)</td>
<td>NS</td>
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<td>Bland,J.D. 2005</td>
<td>Low</td>
<td>N= 4155 ; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>In age quintile 3 vs 1st Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>5.29 (1.79,15.66)</td>
<td>older age is associated with higher odds of CTS</td>
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<td>Bland, J.D. 2005</td>
<td>Low</td>
<td>N= 4155; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>In age quintile 4 vs 1st</td>
<td>Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>7.42 (2.34,23.5)</td>
<td>older age is associated with higher odds of CTS</td>
</tr>
<tr>
<td>Bland, J.D. 2005</td>
<td>Low</td>
<td>N= 4155; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>In age quintile 5 vs 1st</td>
<td>Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>38.33(12.11,121.29)</td>
<td>older age is associated with higher odds of CTS</td>
</tr>
<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Age &lt;30 versus older</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>0.99 (0.59-1.69)</td>
<td>NS</td>
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<tr>
<td>Eleftheriou, A. 2012</td>
<td>Moderate</td>
<td>N= 441; 548 workers of a Governmental data entry &amp; processing unit</td>
<td>personal history of CTS</td>
<td>Age at least 45</td>
<td>Keyboard strokes, age, physical activity, smoking</td>
<td>logistic regression OR</td>
<td>1.16 (0.53 to 2.55)</td>
<td>NS</td>
</tr>
<tr>
<td>Eleftheriou, A. 2012</td>
<td>Moderate</td>
<td>N= 441; 548 workers of a Governmental data entry &amp; processing unit</td>
<td>personal history of CTS or newly diagnosed CTS with CTS-7 algorithm score of 12 or more</td>
<td>Age at least 45</td>
<td>Keyboard strokes, sex, physical activity, age</td>
<td>logistic regression OR</td>
<td>1.48 (0.90 to 2.43)</td>
<td>NS</td>
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<tr>
<td>Study</td>
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<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>Age 2nd vs 1st quartile</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>1.32 (0.44-4.00)</td>
<td>NS</td>
</tr>
<tr>
<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>Age 3rd vs 1st quartile</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>1.50 (0.45-4.96)</td>
<td>NS</td>
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<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>Age 4th vs 1st quartile</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>1.69 (0.50-5.75)</td>
<td>NS</td>
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<tr>
<td>Morgenstern,H. 1991</td>
<td>Moderate</td>
<td>N= 1058 ; grocery store checkers belonging to local California union</td>
<td>symptoms of CTS indicated in questionnaire</td>
<td>Age</td>
<td>matched by: all members were members of union food and commercial workers union ; covariates: age, hours per work week, years worked, age*years worked interaction, use of laser scanner to check items, unload basket before checking, load and lift grocery bags after checking, currently pregnant, contraceptive use, use of exogenous estrogen, use of diuretics, history of broken wrist</td>
<td>logistic regression odds ratio</td>
<td>1.07(P=.002)</td>
<td>odds of CTS are greater in older patients</td>
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<tr>
<td>Shin,J. 2008</td>
<td>Moderate</td>
<td>N= 123 ; All were hemodialysis patients</td>
<td>pain or pain in median nerve distribution and Tinel's sign</td>
<td>Age</td>
<td>age, sex, predialysis plasma BMG level in 1990, duration of dialysis</td>
<td>logistic regression OR</td>
<td>1.43(1.09,1.89)</td>
<td>age is positively associated with CTS odds</td>
</tr>
<tr>
<td>Study</td>
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<td>Population</td>
<td>CTS Diagnostics</td>
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<td>Silverstein,B.A. 1987</td>
<td>Moderate</td>
<td>N= 652 ; workers form seven different industrial sites</td>
<td>based on phalen and tinel’s signs and symptoms mentioned in interview</td>
<td>Age</td>
<td>Gender/Sex, age, years on job, work repetition, level of force involved in job, dummy variables controlling for job center effects</td>
<td>logistic regression OR</td>
<td>1.05 (0.99,1.11)</td>
<td>NS</td>
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<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.</td>
<td>occurrence within last month of “classic/ probable” or “possible” symptoms of CTS</td>
<td>Age 31 to 35 versus 30 or younger</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>1.1 (0.6 –2.1)</td>
<td>NS</td>
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<td>Study</td>
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<td>Population</td>
<td>CTS Diagnostics</td>
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<tr>
<td>Violante, F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.)</td>
<td>occurrence within last month of “classic/ probable” or “possible” symptoms of CTS</td>
<td>Age 36 to 40 versus 30 or younger</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>1.4 (0.8–2.6)</td>
<td>NS</td>
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<tr>
<td>Violante, F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.)</td>
<td>occurrence within last month of “classic/ probable” or “possible” symptoms of CTS</td>
<td>Age 41 to 45 versus 30 or younger</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>2.2 (1.2–4.1)</td>
<td>41 to 45 year olds had greater odds of CTS than people at age 30 or younger</td>
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<tr>
<td>Study</td>
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<tr>
<td>Violante,F.S.</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of</td>
<td>Age 46 to 50 versus 30 or younger</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm</td>
<td>Logistic Regression OR</td>
<td>1.3 (0.7–2.5)</td>
<td>NS</td>
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<tr>
<td>2007</td>
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<td>appliances, underwear, ceramic tiles, and shoes and workers employed in all</td>
<td>CTS</td>
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<td>interaction effect, family history of CTS, pathologies facilitating CTS onset</td>
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<td>municipal nursery schools.</td>
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<td>(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis,</td>
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<td>rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders,</td>
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<td>tendonitis of the finger flexors, and chronic renal failure) alcohol</td>
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<td></td>
<td>consumption, smoking status, previous exposure to biomechanical overload</td>
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<tr>
<td>Violante,F.S.</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of</td>
<td>Age 50 or older versus 30 or younger</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm</td>
<td>Logistic Regression OR</td>
<td>1.7 (0.9–3.3)</td>
<td>NS</td>
</tr>
<tr>
<td>2007</td>
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<td>appliances, underwear, ceramic tiles, and shoes and workers employed in all</td>
<td>CTS</td>
<td></td>
<td>interaction effect, family history of CTS, pathologies facilitating CTS</td>
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<td>municipal nursery schools.</td>
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<td>onset (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis,</td>
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<td>rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders,</td>
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<td>tendonitis of the finger flexors, and chronic renal failure) alcohol</td>
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<td>consumption, smoking status, previous exposure to biomechanical overload</td>
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<td>Armstrong, T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>Wrist index &gt;= 7(depth/width of wrist in cm)</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>2.54 (1.69, 3.82)</td>
<td>wrist index is significantly correlated with median neuropathy</td>
</tr>
<tr>
<td>Kopec, J. 2011</td>
<td>Low</td>
<td>N= 386; all patients were on hemodialysis signs and symptoms verified by nerve conduction studies</td>
<td>location of AV fistula</td>
<td>location of AV fistula</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>NS</td>
</tr>
<tr>
<td>Tsai, N.W. 2013</td>
<td>Low</td>
<td>N= 120 (80 non-DM and 40 DM patients); Patients with clinically suspicious CTS at the out-patient clinics of the Department of Neurology of Kaohsiung Chang Gung Memorial Hospital were evaluated.</td>
<td>clinically and electromyography-confirmed CTS</td>
<td>Cross sectional area of the median nerve at the wrist crease (CSA W)</td>
<td>Gender/Sex, BMI, body weight, CSA outlet, CSA W; clinical and electrophysiologic diagnosis of diabetic polyneuropathy, prior surgery for CTS, and those with gout, rheumatoid arthritis, or abnormal thyroid function related to peripheral neuropathy</td>
<td>Stepwise logistic regression OR</td>
<td>1.21 (1.07-1.38)</td>
<td>In DM patients, increased CSA W increases odds of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Werner,R.A. 2005</td>
<td>Low</td>
<td>N= 189; all were automobile assembly line workers</td>
<td>hand diagram symptoms, and median sensory evoked response that .5 msec longer than ipsilateral ulnar sensory response at 1 year</td>
<td>Elbow posture rating (1–10 scale)</td>
<td>Gender/Sex, wrist/hand tendonitis, diabetes, coworker support, median ulnar peak latency on dominant side, elbow posture rating</td>
<td>logistic regression odds ratio</td>
<td>8.08(1.48–44.22)</td>
<td>higher elbow posture rating was associated with higher odds of CTS</td>
</tr>
<tr>
<td>Boz,C. 2004</td>
<td>Moderate</td>
<td>N= 304; cases were selected and controls were relatives or people accompanying CTS patients</td>
<td>clinical and electrodiagnostic tests</td>
<td>wrist index</td>
<td>matched by: age matched females; covariates: BMI, wrist index, shape index, digit index, hand length/body height ratio</td>
<td>logistic regression odds ratio</td>
<td>1.157(1.099–1.219)</td>
<td>higher wrist index is associated with higher CTS odds</td>
</tr>
<tr>
<td>Boz,C. 2004</td>
<td>Moderate</td>
<td>N= 304; cases were selected and controls were relatives or people accompanying CTS patients</td>
<td>clinical and electrodiagnostic tests</td>
<td>Shape index [hand width(mm)/hand length (mm) × 100]</td>
<td>matched by: age matched females; covariates: BMI, wrist index, shape index, digit index, hand length/body height ratio</td>
<td>logistic regression odds ratio</td>
<td>1.362(1.207–1.537)</td>
<td>higher hand shape index is correlated with higher CTS odds</td>
</tr>
<tr>
<td>Boz,C. 2004</td>
<td>Moderate</td>
<td>N= 304; cases were selected and controls were relatives or people accompanying CTS patients</td>
<td>clinical and electrodiagnostic tests</td>
<td>digit index [third finger length (mm)/hand length (mm) × 100]</td>
<td>matched by: age matched females; covariates: BMI, wrist index, shape index, digit index, hand length/body height ratio</td>
<td>logistic regression odds ratio</td>
<td>1.375(1.164–1.624)</td>
<td>higher digit index shape index is correlated with higher CTS odds</td>
</tr>
<tr>
<td>Boz,C. 2004</td>
<td>Moderate</td>
<td>N= 304; cases were selected and controls were relatives or people accompanying CTS patients</td>
<td>clinical and electrodiagnostic tests</td>
<td>Hand length/body height ratio</td>
<td>matched by: age matched females; covariates: BMI, wrist index, shape index, digit index, hand length/body height ratio</td>
<td>logistic regression odds ratio</td>
<td>1.246(0.650–2.287)</td>
<td>NS</td>
</tr>
<tr>
<td>Boz,C. 2004</td>
<td>Moderate</td>
<td>N= 304; cases were selected and controls were relatives or people accompanying CTS patients</td>
<td>clinical and electrodiagnostic tests</td>
<td>wrist index</td>
<td>matched by: aged matched males; covariates: BMI, wrist index, shape index, digit index, hand length/body height ratio</td>
<td>logistic regression odds ratio</td>
<td>1.047(0.966–1.135)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Boz,C. 2004</td>
<td>Moderate</td>
<td>N= 304 ; cases were selected and controls were relatives or people accompanying CTS patients</td>
<td>clinical and electrodiagnostic tests</td>
<td>Shape index [hand width(mm)/hand length (mm) × 100]</td>
<td>matched by: aged matched males ; covariates: BMI, wrist index, shape index, digit index, hand length/body height ratio</td>
<td>logistic regression odds ratio</td>
<td>1.041(0.878-1.233)</td>
<td>NS</td>
</tr>
<tr>
<td>Boz,C. 2004</td>
<td>Moderate</td>
<td>N= 304 ; cases were selected and controls were relatives or people accompanying CTS patients</td>
<td>clinical and electrodiagnostic tests</td>
<td>digit index [third finger length (mm)/hand length (mm) × 100]</td>
<td>matched by: aged matched males ; covariates: BMI, wrist index, shape index, digit index, hand length/body height ratio</td>
<td>logistic regression odds ratio</td>
<td>1.177(0.880-1.574)</td>
<td>NS</td>
</tr>
<tr>
<td>Boz,C. 2004</td>
<td>Moderate</td>
<td>N= 304 ; cases were selected and controls were relatives or people accompanying CTS patients</td>
<td>clinical and electrodiagnostic tests</td>
<td>Hand length/body height ratio</td>
<td>matched by: aged matched males ; covariates: BMI, wrist index, shape index, digit index, hand length/body height ratio</td>
<td>logistic regression odds ratio</td>
<td>1.069(0.381-2.998)</td>
<td>NS</td>
</tr>
<tr>
<td>Gordon,C. 1988</td>
<td>Moderate</td>
<td>N= 80 ; Midwestern car manufacturing workers</td>
<td>median motor and sensory latencies at 3 years</td>
<td>Wrist ratio</td>
<td>age, sex</td>
<td>regression p value</td>
<td>0.001</td>
<td>wrist ratio predicted median motor latency</td>
</tr>
<tr>
<td>Hlebs,S. 2014</td>
<td>Moderate</td>
<td>convenience and random sampling of N= 100 (50 with CTS and 50 healthy controls); subjects performed various occupations, but the groups were balanced regarding Gender/Sex and age</td>
<td>clinically and electromyography (EMG) confirmed CTS; controls had no signs or symptoms of CTS</td>
<td>Mean wrist index &gt;0.695</td>
<td>diabetes mellitus, rheumatoid arthritis, thyroid disease, neuropathy, infections, thoracic outlet syndrome, neck pain or paresthesia (tingling) in upper limbs, pregnancy, past injury or surgery of the wrist or the neck, BMI, ratio of hand length to body height, mean wrist index &gt;0.695, mean hand shape index, mean digit index</td>
<td>Multiple logistic regression OR</td>
<td>42.89 (9.22, 199.60)</td>
<td>Wrist ratio is associated with increased odds of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<td>Confounding Adjustment</td>
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<tr>
<td>Hlebs, S. 2014</td>
<td>Moderate</td>
<td>convenience and random sampling of N= 100 (50 with CTS and 50 healthy controls); subjects performed various occupations, but the groups were balanced regarding Gender/Sex and age</td>
<td>clinically and electromyography (EMG) confirmed CTS; controls had no signs or symptoms of CTS</td>
<td>mean ratio of hand length to body height</td>
<td>diabetes mellitus, rheumatoid arthritis, thyroid disease, neuropathy, infections, thoracic outlet syndrome, neck pain or paresthesia (tingling) in upper limbs, pregnancy, past injury or surgery of the wrist or the neck, BMI, ratio of hand length to body height, mean wrist index &gt;0.695, mean hand shape index, mean digit index</td>
<td>Multiple logistic regression OR</td>
<td>0.18 (0.04, 0.92)</td>
<td>Hand length-body height ratio decreased odds of CTS</td>
</tr>
<tr>
<td>Hlebs, S. 2014</td>
<td>Moderate</td>
<td>convenience and random sampling of N= 100 (50 with CTS and 50 healthy controls); subjects performed various occupations, but the groups were balanced regarding Gender/Sex and age</td>
<td>clinically and electromyography (EMG) confirmed CTS; controls had no signs or symptoms of CTS</td>
<td>Mean digit index</td>
<td>diabetes mellitus, rheumatoid arthritis, thyroid disease, neuropathy, infections, thoracic outlet syndrome, neck pain or paresthesia (tingling) in upper limbs, pregnancy, past injury or surgery of the wrist or the neck, BMI, ratio of hand length to body height, mean wrist index &gt;0.695, mean hand shape index, mean digit index</td>
<td>Multiple logistic regression OR</td>
<td>1.12 (0.64, 1.96)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>Hlebs,S. 2014</td>
<td>Moderate</td>
<td>convenience and random sampling of N= 100 (50 with CTS and 50 healthy controls); subjects performed various occupations, but the groups were balanced regarding Gender/Sex and age</td>
<td>clinically and electromyography (EMG) confirmed CTS; controls had no signs or symptoms of CTS</td>
<td>Mean hand shape index</td>
<td>diabetes mellitus, rheumatoid arthritis, thyroid disease, neuropathy, infections, thoracic outlet syndrome, neck pain or paresthesia (tingling) in upper limbs, pregnancy, past injury or surgery of the wrist or the neck, BMI, ratio of hand length to body height, mean wrist index &gt;0.695, mean hand shape index, mean digit index</td>
<td>Multiple logistic regression OR</td>
<td>1.22 (0.93, 1.61)</td>
<td>NS</td>
</tr>
<tr>
<td>Matias,A.C. 1998</td>
<td>Moderate</td>
<td>N= 100 ; video display terminal operators at Midwestern university</td>
<td>&quot;medically diagnosed&quot; CTS</td>
<td>Trunk incline</td>
<td>work day duration</td>
<td>logistic regression odds ratio</td>
<td>.898(p=.03)</td>
<td>trunk incline is negatively associated with CTS</td>
</tr>
<tr>
<td>Matias,A.C. 1998</td>
<td>Moderate</td>
<td>N= 100 ; video display terminal operators at Midwestern university</td>
<td>&quot;medically diagnosed&quot; CTS</td>
<td>Wrist extension</td>
<td>work day duration</td>
<td>logistic regression odds ratio</td>
<td>1.057(p=.09)</td>
<td>NS</td>
</tr>
<tr>
<td>Matias,A.C. 1998</td>
<td>Moderate</td>
<td>N= 100 ; video display terminal operators at Midwestern university</td>
<td>&quot;medically diagnosed&quot; CTS</td>
<td>Wrist deviation</td>
<td>work day duration</td>
<td>logistic regression odds ratio</td>
<td>1.098(p=.009)</td>
<td>wrist deviation is positively associated with CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<td>Significance</td>
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<tr>
<td>Matias, A.C. 1998</td>
<td>Moderate</td>
<td>N= 100 ; video display terminal operators at Midwestern university</td>
<td>&quot;medically diagnosed&quot; CTS</td>
<td>overall anthropometric measure factor consisting of measures of wrist circumference, wrist diameter, upper arm length, forearm length, and hand length</td>
<td>work day duration</td>
<td>logistic regression odds ratio</td>
<td>1.406(P=.07)</td>
<td>Overall anthropometric measures are associated with higher CTS odds</td>
</tr>
<tr>
<td>Moghtaderi, A. 2005</td>
<td>Moderate</td>
<td>N= 237 ; cases and controls recruited from same urban area</td>
<td>clinical and electrodiagnostic tests</td>
<td>Wrist ratio</td>
<td>matched by: age ; covariates: sex, BMI, wrist ratio, wrist circumference</td>
<td>logistic regression odds ratio</td>
<td>1.12(1.03, 1.21)</td>
<td>higher wrist ratio is positively associated with CTS</td>
</tr>
<tr>
<td>Moghtaderi, A. 2005</td>
<td>Moderate</td>
<td>N= 237 ; cases and controls recruited from same urban area</td>
<td>clinical and electrodiagnostic tests</td>
<td>Wrist circumference</td>
<td>matched by: age ; covariates: sex, BMI, wrist ratio, wrist circumference</td>
<td>logistic regression odds ratio</td>
<td>.82(.76, .88)</td>
<td>higher wrist circumference is negatively associated with CTS</td>
</tr>
<tr>
<td>Sabry, M.M. 2009</td>
<td>Moderate</td>
<td>N= 78 ; cases presented to neurophysiological laboratory unclear which population controls were recruited from</td>
<td>wrist ratio</td>
<td>CTS symptoms with mild nerve conduction abnormality vs health controls</td>
<td>none</td>
<td>mean difference</td>
<td>0.02(0.04)</td>
<td>wrist ratio is higher in CTS patients with mild conduction abnormality</td>
</tr>
<tr>
<td>Sabry, M.M. 2009</td>
<td>Moderate</td>
<td>N= 69 ; cases presented to neurophysiological laboratory unclear which population controls were recruited from</td>
<td>wrist ratio</td>
<td>CTS symptoms with moderate nerve conduction abnormality vs health controls</td>
<td>none</td>
<td>mean difference</td>
<td>0.03(0.01, 0.05)</td>
<td>wrist ratio is higher in CTS patients with moderate conduction abnormality</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<tr>
<td>Sabry, M.M. 2009</td>
<td>Moderate</td>
<td>N= 68 ; cases presented to neurophysiological laboratory unclear which population controls were recruited from</td>
<td>wrist ratio</td>
<td>CTS symptoms with severe nerve conduction abnormality vs health controls</td>
<td>none</td>
<td>mean difference</td>
<td>0.04 (0.02, 0.06)</td>
<td>wrist ratio is higher in CTS patients with severe conduction abnormality</td>
</tr>
<tr>
<td>Sabry, M.M. 2009</td>
<td>Moderate</td>
<td>N= 78 ; cases presented to neurophysiological laboratory unclear which population controls were recruited from</td>
<td>wrist palm ratio</td>
<td>CTS symptoms with mild nerve conduction abnormality vs health controls</td>
<td>none</td>
<td>mean difference</td>
<td>0.01 (0.02)</td>
<td>wrist palm ratio is higher in CTS patients with mild conduction abnormality</td>
</tr>
<tr>
<td>Sabry, M.M. 2009</td>
<td>Moderate</td>
<td>N= 69 ; cases presented to neurophysiological laboratory unclear which population controls were recruited from</td>
<td>wrist palm ratio</td>
<td>CTS symptoms with moderate nerve conduction abnormality vs health controls</td>
<td>none</td>
<td>mean difference</td>
<td>0.02 (0.04)</td>
<td>wrist palm ratio is higher in CTS patients with moderate conduction abnormality</td>
</tr>
<tr>
<td>Sabry, M.M. 2009</td>
<td>Moderate</td>
<td>N= 68 ; cases presented to neurophysiological laboratory unclear which population controls were recruited from</td>
<td>wrist palm ratio</td>
<td>CTS symptoms with severe nerve conduction abnormality vs health controls</td>
<td>none</td>
<td>mean difference</td>
<td>0.03 (0.01, 0.05)</td>
<td>wrist palm ratio is higher in CTS patients with severe conduction abnormality</td>
</tr>
<tr>
<td>Sharifi-Mollayousefi, A. 2008</td>
<td>Moderate</td>
<td>N= 262 ; cases were from same urban area, and controls were their relatives</td>
<td>clinical and electrodiagnostic tests</td>
<td>Digit index [third finger length (mm)/hand length (mm) × 100]</td>
<td>matched by: age ; covariates: digit index, shape index, wrist ratio, hand length/hand height ratio, BMI</td>
<td>logistic regression odds ratio</td>
<td>1</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<tr>
<td>Sharifi-Mollayousefi,A. 2008</td>
<td>Moderate</td>
<td>N= 262 ; cases were from same urban area, and controls were their relatives</td>
<td>clinical and electrodiagnostic tests</td>
<td>Shape index $\left[\frac{\text{hand width (mm)}}{\text{hand length (mm)}} \times 100\right]$</td>
<td>matched by: age ; covariates: digit index, shape index, wrist ratio, hand length/hand height ratio, BMI</td>
<td>logistic regression odds ratio</td>
<td>1.058</td>
<td>odds of CTS increases as shape index increases</td>
</tr>
<tr>
<td>Sharifi-Mollayousefi,A. 2008</td>
<td>Moderate</td>
<td>N= 262 ; cases were from same urban area, and controls were their relatives</td>
<td>clinical and electrodiagnostic tests</td>
<td>Wrist ratio$\left[\frac{\text{wrist depth (mm)}}{\text{wrist width (mm)}}\right]$</td>
<td>matched by: age ; covariates: digit index, shape index, wrist ratio, hand length/hand height ratio, BMI</td>
<td>logistic regression odds ratio</td>
<td>1.351</td>
<td>odds of CTS increases as wrist ratio index increases</td>
</tr>
<tr>
<td>Sharifi-Mollayousefi,A. 2008</td>
<td>Moderate</td>
<td>N= 262 ; cases were from same urban area, and controls were their relatives</td>
<td>clinical and electrodiagnostic tests</td>
<td>Hand length/height ratio$\left[\frac{\text{hand length (cm)}}{\text{height (m)}}\right]$</td>
<td>matched by: age ; covariates: digit index, shape index, wrist ratio, hand length/hand height ratio, BMI</td>
<td>logistic regression odds ratio</td>
<td>1.002</td>
<td>odds of CTS increases as hand length/height ratio index increases</td>
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<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.)</td>
<td>occurrence within last month of “classic/ probable” or “possible” symptoms of CTS</td>
<td>BMI under 25 with a robust wrist versus BMI under 25 with a slim wrist</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>1.1 (0.7–1.7)</td>
<td>NS</td>
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<tr>
<td>Study</td>
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<td>CTS Diagnostics</td>
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<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.)</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>short height with long forearm length versus short height and short forearm length (tall/long=50th percentile or higher)</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>0.7 (0.4 – 1.1)</td>
<td>NS</td>
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### TABLE 39 RISK FACTOR: ANY FACILITATING COMORBIDITIES

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
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<tbody>
<tr>
<td>Bonfiglioli,R. 2013</td>
<td>High</td>
<td>N= 2492 ; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms at 3 years</td>
<td>1 or more predisposing disease (diabetes, amyloidosis, gout, thyroid disorders, scleroderma, rheumatoid arthritis, systemic lupus erythematosus, and digital flexor tendonitis)</td>
<td>gender/sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>1.60 (1.31, 1.94)</td>
<td>having predisposing diseases increase risk of symptoms</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2013</td>
<td>High</td>
<td>N= 2299 ; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms and NCS test at 3 years</td>
<td>1 or more predisposing disease (diabetes, amyloidosis, gout, thyroid disorders, scleroderma, rheumatoid arthritis, systemic lupus erythematosus, and digital flexor tendonitis)</td>
<td>gender/sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>1.91 (1.26, 2.91)</td>
<td>predisposing conditions increase CTS risk</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.)</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>Presence of pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>2.3 (1.5–3.6)</td>
<td>presence pathologies facilitating CTS onset increases odds of CTS</td>
</tr>
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</table>
### TABLE 40 RISK FACTOR: ARTHRITIS

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>Rheumatoid Arthritis</td>
<td>Model1: ACGIH Hand Activity Level (HAL) ,age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>4.07 (1.43–11.58)</td>
<td>RA is a risk factor for CTS</td>
</tr>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>Rheumatoid Arthritis</td>
<td>Model 2: strain index ,age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>4.14 (1.48–11.59)</td>
<td>RA is a risk factor for CTS</td>
</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 455 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>arthritis yes versus no</td>
<td>Model 3: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex female vs male at the mean hand activity level</td>
<td>logistic regression odds ratio</td>
<td>2.03 (1.02-4.04)</td>
<td>arthritis increases CTS odds</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>Coggon, D. 2013</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>other arthritis present</td>
<td>matched by: sex, age; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression</td>
<td>OR 0.7 (0.5-1.0)</td>
<td>NS</td>
</tr>
<tr>
<td>Geoghegan, J.M. 2004</td>
<td>Moderate</td>
<td>N= 134; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>rheumatoid arthritis</td>
<td>matched by: age, sex, and general practice; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression</td>
<td>OR 2.23 (1.57 - 3.17)</td>
<td>odds are greater in patients with RA</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
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<tr>
<td>Geoghegan, J.M. 2004</td>
<td>Moderate</td>
<td>N= 1233; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>Arthritis</td>
<td>matched by: age, sex, and general practice; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>1.89 (1.65–2.17)</td>
<td>arthritis patients have greater odds of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>working on assembly line</td>
<td>model 1: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, using vibrating tools, assembly line work, twisting forearm work, bending wrist work, using forceful hand grip, using fingers/thumb as pressing tool, using fingers in a pinch grip</td>
<td>logistic regression OR</td>
<td>2.86 (1.64, 5.01)</td>
<td>working on assembly line is associated with higher odds of median neuropathy</td>
</tr>
<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>working on assembly line</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>2.57 (1.46, 4.54)</td>
<td>working on assembly line is associated with higher odds of median neuropathy</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2006</td>
<td>Low</td>
<td>N= 212 ; electric-power tool plant workers</td>
<td>abnormal NCS test and symptoms</td>
<td>assembly line workers versus non-assembly line workers</td>
<td>matched by: all employed at company that manufactures electric-powered tools ; covariates: assembly line vs. non-assembly line work</td>
<td>odds ratio</td>
<td>7.22(2.858, 18.237)</td>
<td>odds of abnormal NCS and symptoms is higher in assembly line workers than in non-assembly line workers</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<tr>
<td>Leclerc, A. 1998</td>
<td>Low</td>
<td>N= 816; assembly line workers and non-repetitive workers (cleaning, maintenance or catering jobs)</td>
<td>Tinel or phalen test positive or nerve condition velocity had been established before medical examination</td>
<td>assembly line work vs non-repetitive work (cleaning, maintenance and catering)</td>
<td>matched by: all were of similar education level; covariates: sex, age, psychological problems, BMI</td>
<td>logistic regression odds ratio</td>
<td>4.54 (2.27 to 9.09)</td>
<td>Odds of CTS are significantly higher in assembly line workers</td>
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### TABLE 42 RISK FACTOR: AUTOMATIC WORK PACE

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td>Petit.A. 2015</td>
<td>Moderate</td>
<td>French salaried workers working in manufacturing industry and services sector as skilled and unskilled blue collar workers</td>
<td>CTS symptoms on the day of medical exam (or for at least 4 days during the preceding 7 days)</td>
<td>work pace dependent on automatic rate</td>
<td>Gender/Sex, age, use of vibrating hand tools, exposure to cold temperature, holding objects in pinch grip, extreme wrist bending posture, pressing with palm base, force, and work organization factors</td>
<td>Logistical Regression OR</td>
<td>1.9 (0.9-4.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>BMI per 5 point increase</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>1.28 (1.12, 1.49)</td>
<td>BMI is significantly correlated with greater odds of median neuropathy</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2013</td>
<td>High</td>
<td>N= 2492 ; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms at 3 years</td>
<td>BMI</td>
<td>sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>1.03 (1.00, 1.06)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2013</td>
<td>High</td>
<td>N= 2299 ; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms and NCS test at 3 years</td>
<td>BMI</td>
<td>sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>1.09 (1.04, 1.14)</td>
<td>BMI increases CTS risk</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>Evanoff,B. 2014</td>
<td>High</td>
<td>711 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>BMI adjusted for age, Gender/Sex, and BMI; past diagnosis of CTS or other upper extremity peripheral neuropathy, had a pacemaker or internal defibrillator, or were pregnant at the time of enrollment excluded</td>
<td>Multivariable mixed logistic regression models OR</td>
<td>1.07 (1.01-1.12)</td>
<td>Higher BMI significantly increases odds of CTS</td>
<td></td>
</tr>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>BMI continuous</td>
<td>Model1: ACGIH Hand Activity Level (HAL) , age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>1.070 (1.02–1.12)</td>
<td>BMI is significantly associated with CTS risk</td>
</tr>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>BMI (continuous)</td>
<td>Model 2: strain index , age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>1.063 1.02–1.11 0.005</td>
<td>BMI is significantly associated with CTS risk</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<tr>
<td>Hakim,A.J. 2002</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>BMI 21.1–23.0 vs 21</td>
<td>matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>0.91(0.69–1.22)</td>
<td>NS</td>
</tr>
<tr>
<td>Hakim,A.J. 2002</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>BMI 23.1–25.0 vs 21</td>
<td>matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>0.89(0.65–1.23)</td>
<td>NS</td>
</tr>
<tr>
<td>Hakim,A.J. 2002</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>BMI 25.1–28.0 vs 21</td>
<td>matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>0.84(0.59–1.21)</td>
<td>NS</td>
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<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<tr>
<td>Hakim, A.J. 2002</td>
<td>High</td>
<td>N= 3674; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>BMI Greater than 28.1 vs 21</td>
<td>matched by: pairs of twins; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>0.84 (0.57–1.23)</td>
<td>NS</td>
</tr>
<tr>
<td>Bland, J.D. 2005</td>
<td>Low</td>
<td>N= 4155; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>BMI in age quintile 1</td>
<td>Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>1.09 (1.06, 1.12)</td>
<td>Higher BMI is a significant risk factor in the first age quintile</td>
</tr>
<tr>
<td>Bland, J.D. 2005</td>
<td>Low</td>
<td>N= 4155; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>BMI in age quintile 2</td>
<td>Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>1.09 (1.06, 1.12)</td>
<td>Higher BMI is a significant risk factor in the second age quintile</td>
</tr>
<tr>
<td>Bland, J.D. 2005</td>
<td>Low</td>
<td>N= 4155; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>BMI in age quintile 3</td>
<td>Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>1.05 (1.02, 1.08)</td>
<td>Higher BMI is a significant risk factor in the third age quintile</td>
</tr>
<tr>
<td>Bland, J.D. 2005</td>
<td>Low</td>
<td>N= 4155; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>BMI in age quintile 4</td>
<td>Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>1.05 (1.01, 1.08)</td>
<td>Higher BMI is a significant risk factor in the first fourth age quintile</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>Bland, J. D. 2005</td>
<td>Low</td>
<td>N= 4155; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>BMI in age quintile 5</td>
<td>Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>1.01 (0.98, 1.04)</td>
<td>NS in fifth age quintile</td>
</tr>
<tr>
<td>Becker, J. 2002</td>
<td>Moderate</td>
<td>N= 1772; cases and controls consisted of patients referred for nerve conduction studies and electromyography.</td>
<td>nerve conduction and electromyography</td>
<td>BMI Gender/Sex interaction effect</td>
<td>BMI over 30, Gender/Sex, age between 41 and 60, diabetes, BMI<em>Gender/Sex interaction effect, Gender/Sex</em>diabetes interaction effect</td>
<td>logistic regression odds ratio</td>
<td>1.25 (1.07, 1.46)</td>
<td>although the overall effect of BMI remained significant in the model (for both Gender/Sex) the effect of BMI was significantly greater in males than in females</td>
</tr>
<tr>
<td>Burt, S. 2011</td>
<td>Moderate</td>
<td>N= 448; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;141</td>
<td>Model 1 Peak force match cat 2 versus 1, Peak force match cat 3 versus 1, Exerts/min cat 2 versus 1 if BMI&lt;30, Exerts/min cat 3 versus 1 if BMI&lt;30, Exerts/min cat 2 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;141, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;142 1.60, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;143</td>
<td>logistic regression odds ratio</td>
<td>0.77 (0.24-2.48)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<td>Significance</td>
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<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 448 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>BMI&gt;=30 versus &lt;30 if exerts/min cat</td>
<td>42</td>
<td>Model 1 Peak force match cat 2 versus 1, Peak force match cat 3 versus 1, Exerts/min cat 2 versus 1 if BMI&lt;30, Exerts/min cat 3 versus 1 if BMI&lt;30, Exerts/min cat 2 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, BMI&gt;=30 versus &lt;30 if exerts/min cat</td>
<td>41, BMI&gt;=30 versus &lt;30 if exerts/min cat</td>
<td>42 1.60</td>
</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 448 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>BMI&gt;=30 versus &lt;30 if exerts/min cat</td>
<td>43</td>
<td>Model 1 Peak force match cat 2 versus 1, Peak force match cat 3 versus 1, Exerts/min cat 2 versus 1 if BMI&lt;30, Exerts/min cat 3 versus 1 if BMI&lt;30, Exerts/min cat 2 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, BMI&gt;=30 versus &lt;30 if exerts/min cat</td>
<td>41, BMI&gt;=30 versus &lt;30 if exerts/min cat</td>
<td>42 1.60, BMI&gt;=30 versus &lt;30 if exerts/min cat</td>
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<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 456 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>BMI</td>
<td>Model 2: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex</td>
<td>logistic regression odds ratio</td>
<td>1.07 (1.03-1.11)</td>
<td>BMI increases CTS odds</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>Burt,S. 2013</td>
<td>Moderate</td>
<td>N= 347 ; workers from hospital, school bus manufacturing plant, and engine assembly plant</td>
<td>electrodiagnostic test, symptoms, hand diagram at 2 years</td>
<td>BMI of at least 30 vs less than 30</td>
<td>model1: time in forceful exertion, BMI&gt;=30, threshold limit value, job strain</td>
<td>hazard ratios</td>
<td>3.19(1.28,7.98)</td>
<td>having a BMI of 30 or greater is associated with higher risk of CTS</td>
</tr>
<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>BMI between 25 and 29.9 vs &lt;25</td>
<td>matched by: sex, age ; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression</td>
<td>OR 1.6 (1.1-2.1)</td>
<td>odds higher in high BMI group</td>
</tr>
<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>BMI of 30 or above vs &lt;25</td>
<td>matched by: sex, age ; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression</td>
<td>OR 2.1 (1.6-2.9)</td>
<td>odds higher in high BMI group</td>
</tr>
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<td>Study</td>
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<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>BMI between 25 and 29.9 vs &lt;25</td>
<td>matched by: sex, age ; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression OR</td>
<td>1.3 (0.9-1.9)</td>
<td>NS</td>
</tr>
<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>BMI of 30 or above vs &lt;25</td>
<td>matched by: sex, age ; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression OR</td>
<td>2.7 (1.9-3.9)</td>
<td>BMI is associated with greater risk of median neuropathy</td>
</tr>
<tr>
<td>Geoghegan,J.M. 2004</td>
<td>Moderate</td>
<td>N= 171; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>BMI &lt;18.5 vs BMI 18.5–25</td>
<td>matched by: age, sex, and general practice ; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>0.64 (0.40–1.01)</td>
<td>NS</td>
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<tr>
<td>Study</td>
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<td>Geoghegan,J.M. 2004</td>
<td>Moderate</td>
<td>N= 3127 ; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>BMI 25.1–30 vs BMI 18.5–25</td>
<td>matched by: age, sex, and general practice ; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>1.63 (1.45–1.84)</td>
<td>odds of CTS are greater in higher BMI group</td>
</tr>
<tr>
<td>Geoghegan,J.M. 2004</td>
<td>Moderate</td>
<td>N= 1422 ; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>BMI 30–40 vs BMI 18.5–25</td>
<td>matched by: age, sex, and general practice ; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>2.06 (1.79–2.38)</td>
<td>odds of CTS are greater in higher BMI group</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>Geoghegan, J.M. 2004</td>
<td>Moderate</td>
<td>N= 140; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>BMI &gt;40 vs BMI 18.5–25</td>
<td>matched by: age, sex, and general practice; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>Logistic regression OR</td>
<td>2.22 (1.53–3.21)</td>
<td>odds of CTS are greater in higher BMI group</td>
</tr>
<tr>
<td>Goodson, J.T. 2014</td>
<td>Moderate</td>
<td>87 CTS and 74 sex-matched general orthopedic patients from an outpatient orthopedic clinic in the Western US.</td>
<td>(1) Electrodiagnostic (EDX) testing results suggestive of abnormal slowing of the median nerve, (2) the presence of clinical symptoms of CTS, and (3) no confounding syndromes/disorders</td>
<td>BMI</td>
<td>excluded confounding conditions; sex, age, education levels, ethnicity, and EDX testing results</td>
<td>Logistical Regression OR</td>
<td>1.09(0.99,1.19)</td>
<td>NS</td>
</tr>
<tr>
<td>Hlebs, S. 2014</td>
<td>Moderate</td>
<td>convenience and random sampling of N= 100 (50 with CTS and 50 healthy controls); subjects performed various occupations, but the groups were balanced regarding Gender/Sex and age</td>
<td>clinically and electromyography (EMG) confirmed CTS; controls had no signs or symptoms of CTS</td>
<td>BMI</td>
<td>diabetes mellitus, rheumatoid arthritis, thyroid disease, neuropathy, infections, thoracic outlet syndrome, neck pain or paresthesia (tingling) in upper limbs, pregnancy, past injury or surgery of the wrist or the neck, BMI, ratio of hand length to body height, mean wrist index &gt;0.695, mean hand shape index, mean digit index</td>
<td>Multiple logistic regression OR</td>
<td>1.43 (1.16, 1.76)</td>
<td>high BMI is associated with increased odds of CTS</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>BMI over 25 vs 25 or less</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>1.73 (0.68-4.44)</td>
<td>NS</td>
</tr>
<tr>
<td>Nordstrom,D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Body mass index (kg/m2) matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>1.08 (1.03, 1.14)</td>
<td>higher BMI increases odds of CTS</td>
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<tr>
<td>Study</td>
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<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.)</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>Overweight BMI over 24.9 with a slim wrist versus BMI under 25 with a slim wrist</td>
<td>sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>1.5 (0.7–3.4)</td>
<td>NS</td>
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<tr>
<td>de Krom,M.C. 1990</td>
<td>Moderate</td>
<td>N= 629; 28 cases and all controls were identified through random sample of patients in the Netherlands. An additional 128 cases were added from a single hospital in the area</td>
<td>clinical history and neurophysiologic testing</td>
<td>slimming courses yes vs no matched by: age and sex stratified random sample ; covariates: height, weight(kg), slimming courses(yes/no), Hours/week in flexion activities, hours/week for extension activities, Varicosis (for men only), for women: years since menopause onset vs pre-menopausal, hysterectomy vs premenopausal</td>
<td>logistic regression odds ratio</td>
<td>1.57(0.92, 2.66)</td>
<td>NS</td>
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### TABLE 44 RISK FACTOR: BENDING

<table>
<thead>
<tr>
<th>Study</th>
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<tbody>
<tr>
<td>Armstrong, T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>bending wrist frequently</td>
<td>model 1: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, using vibrating tools, assembly line work, twisting forearm work, bending wrist work, using forceful hand grip, using fingers/thumb as pressing tool, using fingers in a pinch grip</td>
<td>logistic regression OR</td>
<td>1.72 (1.07, 2.76)</td>
<td>bending wrist frequently is associated with higher odds of median neuropathy</td>
</tr>
<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>peak exposure to Wrist bending</td>
<td>age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistic Regression OR</td>
<td>0.98 (0.46, 2.10)</td>
<td>NS</td>
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<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Wrist bending in most recent job age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>1.48 (0.71, 3.12)</td>
<td>NS</td>
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<tr>
<td>Evanoff, B. 2012</td>
<td>Moderate</td>
<td>N= 745 ; newly employed workers symptoms and NCS at 3 years</td>
<td>hand wrist bending age, Gender/Sex, lifting at least 1kg, forceful grip, finger/thumb pressing, using vibrating tools, pinch grip, forearm rotation, hand/wrist bending</td>
<td>NR</td>
<td>NR</td>
<td>NS</td>
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<tr>
<td>Nordstrom, D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Bending/twisting hand 0.25-1.75 hours/day vs none matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>Logistic regression OR</td>
<td>2.42 (0.88, 6.62)</td>
<td>NS</td>
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<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Bending/twisting hand 2-3 hours/day vs none hours/day vs none</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>1.27 (0.50, 3.26)</td>
<td>NS</td>
</tr>
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<td>Nordstrom,D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Bending/twisting hand 3.5-6 hours/day vs none</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>2.65 (1.83, 5.92)</td>
<td>higher in workers who bend/twist hand 3.5-6 hours/day</td>
</tr>
<tr>
<td>Nordstrom,D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Bending/twisting hand -16 hours/day vs none</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>2.11 (0.98, 4.52)</td>
<td>NS</td>
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<td>clinical history and neurophysiologic testing</td>
<td>increased CTS odds for 1 hour increase in flexion</td>
<td>matched by: age and sex stratified random sample; covariates: height, weight(kg), slimming courses(yes/no), Hours/week in flexion activities, hours/week for extension activities, Varicosis (for men only), for women: years since menopause onset vs premenopausal, hysterectomy vs premenopausal</td>
<td>logistic regression odds ratio</td>
<td>1.05(1.02, 1.08)</td>
<td>working longer hours in activities requiring wrist flexion is associated with higher CTS odds</td>
</tr>
<tr>
<td>de Krom,M.C. 1990</td>
<td>Moderate</td>
<td>N= 629; 28 cases and all controls were identified through random sample of patients in the Netherlands. An additional 128 cases were added from a single hospital in the area</td>
<td>clinical history and neurophysiologic testing</td>
<td>increased CTS odds for 1 hour increase in extension</td>
<td>matched by: age and sex stratified random sample; covariates: height, weight(kg), slimming courses(yes/no), Hours/week in flexion activities, hours/week for extension activities, Varicosis (for men only), for women: years since menopause onset vs premenopausal, hysterectomy vs premenopausal</td>
<td>logistic regression odds ratio</td>
<td>1.04(1.09)</td>
<td>working longer hours in activities requiring wrist extension is associated with higher CTS odds</td>
</tr>
</tbody>
</table>
**TABLE 45 RISK FACTOR: CHEMICALS**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordstrom, D.L., 1997</td>
<td>Moderate</td>
<td>N= 417; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Contact with solvents 0.08-0.75 hours/day vs none</td>
<td>matched by: age; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>0.44 (0.21, 0.90)</td>
<td>odds lower in workers with .08 to .75 hours of contact with solvents</td>
</tr>
<tr>
<td>Nordstrom, D.L., 1997</td>
<td>Moderate</td>
<td>N= 417; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Contact with solvents 1-11 hours/day vs none</td>
<td>matched by: age; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>0.80 (0.36, 1.79)</td>
<td>NS</td>
</tr>
</tbody>
</table>
### TABLE 46 RISK FACTOR: CLERICAL

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hakim, A.J. 2002</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Occupation (clerical vs. non-clerical)</td>
<td>matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>1.13(0.90–1.43)</td>
<td>NS</td>
</tr>
<tr>
<td>Jenkins, P.J. 2013</td>
<td>Low</td>
<td>N= unclear ; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Administrative and secretarial occupations vs. Associate professional and technical occupations</td>
<td>matched by: all males ; covariates: Administrative and secretarial occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>2.21 (1.00–4.73)</td>
<td>NS</td>
</tr>
<tr>
<td>Jenkins, P.J. 2013</td>
<td>Low</td>
<td>N= unclear ; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Administrative and secretarial occupations vs. Associate professional and technical occupations</td>
<td>matched by: all females ; covariates: Administrative and secretarial occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>1.76 (1.14–2.81)</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
</tbody>
</table>
### TABLE 47 RISK FACTOR: COLD EXPOSURE

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiang, H.C. 1990</td>
<td>Moderate</td>
<td>N= 269; workers at frozen food plants</td>
<td>neurological examinations and electrophysiological tests</td>
<td>work exposure to cold vs no exposure to cold</td>
<td>Age, sex, length of employment, exposure to cold(frozen food packers), repetitive movement (frozen and non-frozen food packers), and cold*repetitious movement interaction</td>
<td>logistic regression odds ratio</td>
<td>1.85 (1.10, 3.13)</td>
<td>exposure to cold is a significant predictor of CTS</td>
</tr>
</tbody>
</table>
### TABLE 48 RISK FACTOR: COMORBIDITY DRUG USE

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hakim, A.J. 2002</td>
<td>High</td>
<td>N= 3674; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Current thyroxine replacement therapy</td>
<td>matched by: pairs of twins; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>1.13 (0.72–1.78)</td>
<td>NS</td>
</tr>
<tr>
<td>Geoghegan, J.M. 2004</td>
<td>Moderate</td>
<td>N= 766; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>Corticosteroid</td>
<td>matched by: age, sex, and general practice; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>1.07 (0.90–1.27)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
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<tr>
<td>Geoghegan, J. M. 2004</td>
<td>Moderate</td>
<td>N= 415 ; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>Thyroxine</td>
<td>matched by: age, sex, and general practice ; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>1.36 (1.08– 1.70)</td>
<td>odds are greater in patients who use Thyroxine</td>
</tr>
<tr>
<td>Morgenstern, H. 1991</td>
<td>Moderate</td>
<td>N= 1049 ; grocery store checkers belonging to local California union</td>
<td>symptoms of CTS indicated in questionnaire</td>
<td>use of diuretics</td>
<td>matched by: all members were members of union food and commercial workers union ; covariates: age, hours per work week, years worked, age*years worked interaction, use of laser scanner to check items, unload basket before checking, load and lift grocery bags after checking, currently pregnant, contraceptive use, use of exogenous estrogen, use of diuretics, history of broken wrist</td>
<td>logistic regression odds ratio</td>
<td>2.66 (1.00, 7.04)</td>
<td>NS</td>
</tr>
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</table>
### TABLE 49 RISK FACTOR: COMPUTER WORK

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ali,K.M. 2006</td>
<td>Moderate</td>
<td>N= 648 ; computer professionals from 21 companies</td>
<td>Phalen's and Tinel's test</td>
<td>4-8 years of computer work vs &lt;4 years</td>
<td>age, Gender/Sex, smoking, alcohol use, BMI, years of computer work, hours of computer work per day, system administrator job vs other job functions, and internet use in leisure time</td>
<td>logistic regression odds ratio</td>
<td>2.1(1.3,3.6)</td>
<td>Years of computer use is associated with greater CTS odds</td>
</tr>
<tr>
<td>Ali,K.M. 2006</td>
<td>Moderate</td>
<td>N= 648 ; computer professionals from 21 companies</td>
<td>Phalen’s and Tinel's test</td>
<td>8 or more years of computer work vs &lt;4 years</td>
<td>age, Gender/Sex, smoking, alcohol use, BMI, years of computer work, hours of computer work per day, system administrator job vs other job functions, and internet use in leisure time</td>
<td>logistic regression odds ratio</td>
<td>2.7(1.3,5.8)</td>
<td>Years of computer use is associated with greater CTS odds</td>
</tr>
<tr>
<td>Ali,K.M. 2006</td>
<td>Moderate</td>
<td>N= 648 ; computer professionals from 21 companies</td>
<td>Phalen’s and Tinel's test</td>
<td>computer used 8 to 12 hours vs less than 8 hours</td>
<td>age, Gender/Sex, smoking, alcohol use, BMI, years of computer work, hours of computer work per day, system administrator job vs other job functions, and internet use in leisure time</td>
<td>logistic regression odds ratio</td>
<td>3.6(1.3,10.3)</td>
<td>using a computer more hours per day is associated with greater CTS odds</td>
</tr>
<tr>
<td>Ali,K.M. 2006</td>
<td>Moderate</td>
<td>N= 648 ; computer professionals from 21 companies</td>
<td>Phalen’s and Tinel's test</td>
<td>computer used more than 12 hours vs less than 8 hours</td>
<td>age, Gender/Sex, smoking, alcohol use, BMI, years of computer work, hours of computer work per day, system administrator job vs other job functions, and internet use in leisure time</td>
<td>logistic regression odds ratio</td>
<td>4.4(1.3,14.9)</td>
<td>using a computer more hours per day is associated with greater CTS odds</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
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</tr>
<tr>
<td>Ali,K.M. 2006</td>
<td>Moderate</td>
<td>N= 648 ; computer professionals from 21 companies</td>
<td>Phalen’s and Tinel's test</td>
<td>system administrator vs other job functions</td>
<td>age, Gender/Sex, smoking, alcohol use, BMI, years of computer work, hours of computer work per day, system administrator job vs other job functions, and internet use in leisure time</td>
<td>logistic regression odds ratio</td>
<td>2.4(1.2, 4.8)</td>
<td>being a system administrator increases odds of CTS compared to other job functions</td>
</tr>
<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>use of keyboard &gt;4 hours per day</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression OR</td>
<td>0.6 (0.4-0.8)</td>
<td>patients testing positive were less likely to use keyboard or mouse more than 4 hours per day</td>
</tr>
<tr>
<td>Eleftheriou,A. 2012</td>
<td>Moderate</td>
<td>N= 441 ; 548 workers of a Governmental data entry &amp; processing unit</td>
<td>personal history of CTS</td>
<td>at least 240,500,000 vs &lt;240,500,000 keyboard strokes</td>
<td>Keyboard strokes, age, physical activity, smoking</td>
<td>logistic regression OR</td>
<td>2.23 (1.09 to 4.52)</td>
<td>higher key strokes associated with higher CTS odds</td>
</tr>
<tr>
<td>Eleftheriou,A. 2012</td>
<td>Moderate</td>
<td>N= 441 ; 548 workers of a Governmental data entry &amp; processing unit</td>
<td>personal history of CTS or newly diagnosed CTS with CTS-7 algorithm score of 12 or more</td>
<td>at least 240,500,000 vs &lt;240,500,000 keyboard strokes</td>
<td>Keyboard strokes, gender/sex, physical activity, age</td>
<td>logistic regression OR</td>
<td>2.41 (1.36 to 4.25)</td>
<td>higher key strokes associated with higher CTS odds</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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</tr>
<tr>
<td>Armstrong, T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>construction vs clerical work</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>7.01 (2.65, 18.54)</td>
<td>construction workers are at significantly higher odds of median neuropathy</td>
</tr>
</tbody>
</table>
**TABLE 51 RISK FACTOR: DEXTERTY**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
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<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N = 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>dexterity derived from factor analysis (O*NET subscales: manual and finger dexterity, wrist finger speed, and time spent handling objects)2nd vs 1st quartile</td>
<td>Model 3 with O*NET factor variables: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>1.48 (0.80, 2.74)</td>
<td>NS</td>
</tr>
<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N = 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>dexterity derived from factor analysis (O*NET subscales: manual and finger dexterity, wrist finger speed, and time spent handling objects)3rd vs 1st quartile</td>
<td>Model 3 with O*NET factor variables: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>1.11 (0.61, 2.00)</td>
<td>NS</td>
</tr>
<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N = 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>dexterity derived from factor analysis (O*NET subscales: manual and finger dexterity, wrist finger speed, and time spent handling objects)4th vs 1st quartile</td>
<td>Model 3 with O*NET factor variables: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>1.79 (1.01, 3.18)</td>
<td>Workers in the highest quartile are at significantly higher odds of median neuropathy than workers in the lowest quartile</td>
</tr>
</tbody>
</table>
### TABLE 52 RISK FACTOR: DIABETES

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>diabetes history</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>2.45 (0.92, 6.53)</td>
<td>NS</td>
</tr>
<tr>
<td>Becker,J. 2002</td>
<td>Moderate</td>
<td>N= 1772; cases and controls consisted of patients referred for nerve conduction studies and electromyography.</td>
<td>nerve conduction and electromyography</td>
<td>female Gender/Sex and diabetes interaction effect</td>
<td>BMI over 30, Gender/Sex, age between 41 and 60, diabetes, BMI<em>Gender/Sex interaction effect, Gender/Sex</em>diabetes interaction effect</td>
<td>logistic regression odds ratio</td>
<td>1.15(0.84,1.57)</td>
<td>no significant interaction between diabetes and Gender/Sex</td>
</tr>
<tr>
<td>Becker,J. 2002</td>
<td>Moderate</td>
<td>N= 1772; cases and controls consisted of patients referred for nerve conduction studies and electromyography.</td>
<td>nerve conduction and electromyography</td>
<td>Diabetes</td>
<td>BMI over 30, Gender/Sex, age between 41 and 60, diabetes, BMI<em>Gender/Sex interaction effect, Gender/Sex</em>diabetes interaction effect</td>
<td>logistic regression odds ratio</td>
<td>1.49(1.09,2.04)</td>
<td>Diabetes increases odds of CTS</td>
</tr>
<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>diabetes vs no diabetes</td>
<td>matched by: gender/sex, age; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression OR</td>
<td>1.6 (0.9-3.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Geoghegan,J.M. 2004</td>
<td>Moderate</td>
<td>N= 494 ; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>Diabetes</td>
<td>matched by: age, gender/sex, and general practice ; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>1.51 (1.24–1.84)</td>
<td>odds are greater in diabetic patients</td>
</tr>
<tr>
<td>Geoghegan,J.M. 2004</td>
<td>Moderate</td>
<td>N= 137 ; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>Insulin use</td>
<td>matched by: age, gender/sex, and general practice ; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>1.52 (1.06–2.18)</td>
<td>odds are greater in patients who use insulin</td>
</tr>
<tr>
<td>Geoghegan,J.M. 2004</td>
<td>Moderate</td>
<td>N= 149 ; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>Metformin use</td>
<td>matched by: age, gender/sex, and general practice ; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>1.2 (0.84–1.72)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Geoghegan, J.M., 2004</td>
<td>Moderate</td>
<td>N= 197; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>Sulphonyl use</td>
<td>matched by: age, gender/sex, and general practice; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>1.45 (1.07–1.97)</td>
<td>odds are greater in patients who use sulphonyl</td>
</tr>
<tr>
<td>Plastino, M., 2011</td>
<td>Moderate</td>
<td>N= 245; CTS patients from a single hospital, and controls from patients friends or non-blood relatives</td>
<td>confirmed by electrodiagnostic exam</td>
<td>abnormal glucose metabolism abnormalities by 2h_OGTT</td>
<td>weight circumference, BMI, age</td>
<td>p value</td>
<td>0.001</td>
<td>odds are higher in patients with glucose metabolism abnormalities</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Kopec J. 2011</td>
<td>Low</td>
<td>N= 386; all patients were on hemodialysis</td>
<td>signs and symptoms verified by nerve conduction studies</td>
<td>number of years on hemodialysis</td>
<td>hemodialysis</td>
<td>p value from chi squared test</td>
<td>&lt;.00001</td>
<td>CTS patients have been on hemodialysis significantly longer than non-CTS hemodialysis patients</td>
</tr>
<tr>
<td>Shin J. 2008</td>
<td>Moderate</td>
<td>N= 123; All were hemodialysis patients</td>
<td>pain or pain in median nerve distribution and Tinel's sign</td>
<td>duration of dialysis</td>
<td>age, gender/sex, predialysis plasma BMG level in 1990, duration of dialysis</td>
<td>logistic regression OR</td>
<td>1.06(1.01,1.11)</td>
<td>Duration of Dialysis is associated with increased CTS odds</td>
</tr>
<tr>
<td>Shin J. 2008</td>
<td>Moderate</td>
<td>N= 123; All were hemodialysis patients</td>
<td>pain or pain in median nerve distribution and Tinel's sign</td>
<td>predialysis plasma BMG level in 1990</td>
<td>age, gender/sex, predialysis plasma BMG level in 1990, duration of dialysis</td>
<td>logistic regression OR</td>
<td>1.65(1.13,2.41)</td>
<td>higher BMG levels were associated with higher CTS odds</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<tr>
<td>Evanoff, B. 2014</td>
<td>High</td>
<td>711 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Dynamic strength importance in current job</td>
<td>adjusted for age, Gender/Sex, and BMI; past diagnosis of CTS or other upper extremity peripheral neuropathy, had a pacemaker or internal defibrillator, or were pregnant at the time of enrollment excluded</td>
<td>Multivariable mixed logistic regression models OR</td>
<td>2.14 (.56-8.22)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<tr>
<td>Kaplan, Y. 2008</td>
<td>Low</td>
<td>N= 221 ; all were postmenopausal women</td>
<td>NCS</td>
<td>education</td>
<td>matched by: age matched females ; covariates: education level</td>
<td>p-value</td>
<td>&gt;.05</td>
<td>NS</td>
</tr>
<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Maternal Education (finished high school) versus some high school</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>1.58 (0.4-9.94)</td>
<td>NS</td>
</tr>
<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Maternal Education (college or above) versus some high school</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>10.4 (1-148)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli, R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS symptoms</td>
<td>Education &gt;8 years</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>1.48(0.77–2.86)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS diagnosis with clinical and electrodiagnostic examinations</td>
<td>Education &gt;8 years</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>2.15(0.75–6.17)</td>
<td>NS</td>
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</table>
### TABLE 56 RISK FACTOR: ENDOCRINE

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nathan,P.A. 2002</td>
<td>Moderate</td>
<td>N= 256; workers at 4 industrial sites (a steel mill, meat/food packaging, electronics, and plastics).</td>
<td>electrodiagnostic test and symptoms at 11 years</td>
<td>endocrine condition</td>
<td>repetitious movement, heavy lifting, keyboard use, vibration tools, force, cigarette use, Gender/Sex, age, BMI, avocational activities, hormone use, race/ethnicity, endocrine condition, years on job</td>
<td>logistic regression odds ratio</td>
<td>.23 (.04–1.24)</td>
<td>NS</td>
</tr>
</tbody>
</table>
**TABLE 57 RISK FACTOR: EXERTION**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 448 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Exerts/min cat 2 versus 1 if BMI&lt;30</td>
<td>Model 1 Peak force match cat 2 versus 1, Peak force match cat 3 versus 1, Exerts/min cat 2 versus 1 if BMI&lt;30, Exerts/min cat 3 versus 1 if BMI&lt;30, Exerts/min cat 2 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, BMI&gt;=30 versus &lt;30 if exerts/min cat¼1, BMI&gt;=30 versus &lt;30 if exerts/min cat¼2 1.60, BMI&gt;=30 versus &lt;30 if exerts/min cat¼3</td>
<td>logistic regression odds ratio</td>
<td>1.40 (0.45-4.34)</td>
<td>NS</td>
</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 448 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Exerts/min cat 3 versus 1 if BMI&lt;30</td>
<td>Model 1 Peak force match cat 2 versus 1, Peak force match cat 3 versus 1, Exerts/min cat 2 versus 1 if BMI&lt;30, Exerts/min cat 3 versus 1 if BMI&lt;30, Exerts/min cat 2 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, BMI&gt;=30 versus &lt;30 if exerts/min cat¼1, BMI&gt;=30 versus &lt;30 if exerts/min cat¼2 1.60, BMI&gt;=30 versus &lt;30 if exerts/min cat¼3</td>
<td>logistic regression odds ratio</td>
<td>1.13 (0.44-2.93)</td>
<td>NS</td>
</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 448 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Exerts/min cat 2 versus 1 if BMI&gt;=30</td>
<td>Model 1 Peak force match cat 2 versus 1, Peak force match cat 3 versus 1, Exerts/min cat 2 versus 1 if BMI&lt;30, Exerts/min cat 3 versus 1 if BMI&lt;30, Exerts/min cat 2 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, BMI&gt;=30 versus &lt;30 if exerts/min cat¼1, BMI&gt;=30 versus &lt;30 if exerts/min cat¼2 1.60, BMI&gt;=30 versus &lt;30 if exerts/min cat¼3</td>
<td>logistic regression odds ratio</td>
<td>2.92 (0.90-9.46)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 448 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Exerts/min cat 3 versus 1 if BMI&gt;=30</td>
<td>Model 1 Peak force match cat 2 versus 1, Peak force match cat 3 versus 1, Exerts/min cat 2 versus 1 if BMI&lt;30, Exerts/min cat 3 versus 1 if BMI&lt;30, Exerts/min cat 2 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, BMI&gt;=30 versus &lt;30 if exerts/min cat41, BMI&gt;=30 versus &lt;30 if exerts/min cat42 1.60, BMI&gt;=30 versus &lt;30 if exerts/min cat43</td>
<td>logistic regression odds ratio</td>
<td>3.35 (1.14-9.87)</td>
<td>the highest frequency of exertions per minute(&gt;= 15) increases the odds of CTS among obese workers</td>
</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 456 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>peak worker perceived exertion rating (0-10)</td>
<td>Model 2: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex</td>
<td>logistic regression odds ratio</td>
<td>1.14 (1.01-1.29)</td>
<td>worker perceived exertion rating increases odds of CTS</td>
</tr>
<tr>
<td>Burt,S. 2013</td>
<td>Moderate</td>
<td>N= 347 ; workers from hospital, school bus manufacturing plant, and engine assembly plant</td>
<td>electrodiagnostic test, symptoms, hand diagram at 2 years</td>
<td>time in forceful exertion between 20 and 60% vs &lt;20%</td>
<td>model1: time in forceful exertion, BMI&gt;=30, threshold limit value, job strain</td>
<td>hazard ratios</td>
<td>2.83(1.18,6.79)</td>
<td>Having between 20% and 60% of work time involve forceful exertion is associated with higher risk of CTS than workers with &lt;20% forceful exertion time</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Burt,S. 2013</td>
<td>Moderate</td>
<td>N= 347 ; workers from hospital, school bus manufacturing plant, and engine assembly plant</td>
<td>electrodiagnostic test, symptoms, hand diagram at 2 years</td>
<td>time in forceful exertion between greater than 60% vs &lt;20%</td>
<td>model1: time in forceful exertion, BMI&gt;=30, threshold limit value, job strain</td>
<td>hazard ratios</td>
<td>19.57(5.96,64.24)</td>
<td>Having greater than 60% of work time involve forceful exertion is associated with higher risk of CTS than workers with &lt;20% forceful exertion time</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<tr>
<td>Roquelaure, Y. 2008</td>
<td>Moderate</td>
<td>N= 193802; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Farmers vs unemployed</td>
<td>matched by: among men; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>1.3 [0.8-2.3]</td>
<td>NS</td>
</tr>
<tr>
<td>Roquelaure, Y. 2008</td>
<td>Moderate</td>
<td>N= 194276; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Farmers vs unemployed</td>
<td>matched by: among women; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>1.2 [0.8-2.0]</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<tr>
<td>Hakim,A.J.</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Perimenopause vs premenopausal matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>1.53(1.01–2.32)</td>
<td>perimenopausal at higher odds of CTS than premenopausal</td>
<td></td>
</tr>
<tr>
<td>Hakim,A.J.</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Postmenopausal vs premenopausal matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>1.43(0.89–2.29)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Hakim,A.J.</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Hysterectomy After controlling for menopause matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>1.2(0.89–1.63)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Hakim,A.J.</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Current use of HRT matched by: pairs of twins ; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>0.85(0.62–1.16)</td>
<td>NS</td>
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<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
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<tr>
<td>Kaplan, Y. 2008</td>
<td>Low</td>
<td>N= 221; all were postmenopausal women</td>
<td>NCS</td>
<td>number of pregnancies</td>
<td>matched by: age matched females; covariates: number of pregnancies</td>
<td>mean difference</td>
<td>1.07 (0.67, 1.47)</td>
<td>number of pregnancies was higher in postmenopausal CTS women than postmenopausal healthy controls</td>
</tr>
<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Second or Third live birth versus first live birth</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>1.22 (1.05-1.75)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
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<td>CTS Diagnostics</td>
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<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>10+ prenatal care visits versus &lt;10 prenatal care visits</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>2.95 (1.88-4.62)</td>
<td>NS</td>
</tr>
<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Normal BMI 18.5+ kg/m sq (excessive Gestational Weight Gain) versus Normal BMI 18.5+ kg/m sq (adequate Gestational Weight Gain)</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>1.33 (0.41-3.86)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
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<td>CTS Diagnostics</td>
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<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Overweight BMI 25+ to 29.9 kg/m sq (excessive Gestational Weight Gain) versus Normal BMI 18.5+ kg/m sq (adequate Gestational Weight Gain)</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>1.75 (0.38-12.48)</td>
<td>NS</td>
</tr>
<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Obese BMI 30+ kg/m sq (normal Gestational Weight Gain) versus Normal BMI 18.5+ kg/m sq (adequate Gestational Weight Gain)</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>2.99 (1.81-16.79)</td>
<td>BMI of 30 or more increases odds of CTS even with normal gestational weight gain</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Obese BMI 30+ kg/m sq (excessive Gestational Weight Gain)</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>1.27 (0.11-12.74)</td>
<td>NS</td>
</tr>
<tr>
<td>Geoghegan, J. M. 2004</td>
<td>Moderate</td>
<td>N= 2355; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>hormone replacement therapy use</td>
<td>matched by: age, gender/sex, and general practice; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>0.95 (0.84-1.08)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
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<tr>
<td>Geoghegan,J.M. 2004</td>
<td>Moderate</td>
<td>N= 1932 ; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>combined oral contraceptive pill use</td>
<td>matched by: age, gender/sex, and general practice ; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>0.82 (0.71–0.95)</td>
<td>NS</td>
</tr>
<tr>
<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>Oral contraceptive yes vs no</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>1.52 (0.58–4.04)</td>
<td>NS</td>
</tr>
<tr>
<td>Morgenstern,H. 1991</td>
<td>Moderate</td>
<td>N= 1049 ; grocery store checkers belonging to local California union</td>
<td>symptoms of CTS indicated in questionnaire</td>
<td>Use of oral contraceptives</td>
<td>matched by: all members were members of union food and commercial workers union ; covariates: age, hours per work week, years worked, age*years worked interaction, use of laser scanner to check items, unload basket before checking, load and lift grocery bags after checking, currently pregnant, contraceptive use, use of exogenous estrogen, use of diuretics, history of broken wrist</td>
<td>logistic regression odds ratio</td>
<td>0.84 (0.46, 1.56)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>de Krom,M.C. 1990</td>
<td>Moderate</td>
<td>N= 629; 28 cases and all controls were identified through random sample of patients in the Netherlands. An additional 128 cases were added from a single hospital in the area</td>
<td>clinical history and neurophysiologic testing</td>
<td>menopause in last year vs premenopausal</td>
<td>matched by: age and gender/sex stratified random sample; covariates: height, weight(kg), slimming courses(yes/no), Hours/week in flexion activities, hours/week for extension activities, Varicosis (for men only), for women: years since menopause onset vs premenopausal</td>
<td>logistic regression odds ratio</td>
<td>2.32(0.79, 6.81)</td>
<td>NS</td>
</tr>
<tr>
<td>de Krom,M.C. 1990</td>
<td>Moderate</td>
<td>N= 629; 28 cases and all controls were identified through random sample of patients in the Netherlands. An additional 128 cases were added from a single hospital in the area</td>
<td>clinical history and neurophysiologic testing</td>
<td>menopause 2 to 5 years ago vs premenopausal</td>
<td>matched by: age and gender/sex stratified random sample; covariates: height, weight(kg), slimming courses(yes/no), Hours/week in flexion activities, hours/week for extension activities, Varicosis (for men only), for women: years since menopause onset vs premenopausal</td>
<td>logistic regression odds ratio</td>
<td>0.87(0.26, 2.93)</td>
<td>NS</td>
</tr>
<tr>
<td>de Krom,M.C. 1990</td>
<td>Moderate</td>
<td>N= 629; 28 cases and all controls were identified through random sample of patients in the Netherlands. An additional 128 cases were added from a single hospital in the area</td>
<td>clinical history and neurophysiologic testing</td>
<td>menopause more than 5 years ago vs premenopausal</td>
<td>matched by: age and gender/sex stratified random sample; covariates: height, weight(kg), slimming courses(yes/no), Hours/week in flexion activities, hours/week for extension activities, Varicosis (for men only), for women: years since menopause onset vs premenopausal</td>
<td>logistic regression odds ratio</td>
<td>0.49(0.17, 1.39)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>de Krom.M.C. 1990</td>
<td>Moderate</td>
<td>N= 629; 28 cases were identified through random sample of patients in the Netherlands. An additional 128 cases were added from a single hospital in the area</td>
<td>clinical history and neurophysiologic testing</td>
<td>hysterectomy vs premenopausal</td>
<td>matched by: age and gender/sex stratified random sample; covariates: height, weight(kg), slimming courses(yes/no), Hours/week in flexion activities, hours/week for extension activities, Varicosis (for men only), for women: years since menopause onset vs pre-menopausal, hysterectomy vs premenopausal</td>
<td>logistic regression odds ratio</td>
<td>1.8(0.87, 3.73)</td>
<td>NS</td>
</tr>
<tr>
<td>de Krom.M.C. 1990</td>
<td>Moderate</td>
<td>N= 629; 28 cases were identified through random sample of patients in the Netherlands. An additional 128 cases were added from a single hospital in the area</td>
<td>clinical history and neurophysiologic testing</td>
<td>hysterectomy vs menopause more than 5 years ago</td>
<td>matched by: age and gender/sex stratified random sample; covariates: height, weight(kg), slimming courses(yes/no), Hours/week in flexion activities, hours/week for extension activities, Varicosis (for men only), for women: years since menopause onset vs pre-menopausal, hysterectomy vs premenopausal</td>
<td>logistic regression odds ratio</td>
<td>1.8(0.87, 3.73)</td>
<td>NS</td>
</tr>
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**TABLE 60 RISK FACTOR: FIBROMYALGIA**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fahmi.D.S. 2013</td>
<td>Moderate</td>
<td>N= 100; all are housewives with moderate socio-economic standing</td>
<td>electrophysiologically diagnosed</td>
<td>fibromyalgia</td>
<td>fibromyalgia</td>
<td>risk ratio</td>
<td>6.65(2.33, 19.027)</td>
<td>odds higher in fibromyalgia patients</td>
</tr>
</tbody>
</table>
TABLE 61 RISK FACTOR: FORCE

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>upper extremity force derived from factor analysis(includes Occupational Information Network(O*NET): general physical activity, static strength, explosive strength on ) 2nd quartile vs 1st quartile</td>
<td>Model 3 with O*NET factor variables: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>2.15 (1.10, 4.18)</td>
<td>Workers who use more upper extremity force are at higher odds of median neuropathy</td>
</tr>
<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>upper extremity force derived from factor analysis(includes Occupational Information Network(O*NET): general physical activity, static strength, explosive strength on ) 2nd quartile vs 1st quartile</td>
<td>Model 3 with O*NET factor variables: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>3.48 (1.81, 6.66)</td>
<td>Workers who use more upper extremity force are at higher odds of median neuropathy</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>upper extremity force derived from factor analysis(includes Occupational Information Network(O*NET): general physical activity, static strength, explosive strength on ) 3rd quartile vs 1st quartile</td>
<td>Model 3 with O*NET factor variables: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>2.48 (1.19, 5.15)</td>
<td>Workers who use more upper extremity force are at higher odds of median neuropathy</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2013</td>
<td>High</td>
<td>N= 2299 ; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms and NCS test at 3 years</td>
<td>peak force, unitary increase (1-7)</td>
<td>Gender/sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>logistic regression OR</td>
<td>1.09(.97, 1.22)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Burt, S. 2011</td>
<td>Moderate</td>
<td>N= 448 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Peak force match cat 2 versus 1</td>
<td>Model 1 Peak force match cat 2 versus 1, Peak force match cat 3 versus 1, Exerts/min cat 2 versus 1 if BMI&lt;30, Exerts/min cat 3 versus 1 if BMI&lt;30, Exerts/min cat 2 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;1, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;1, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;1, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;1</td>
<td>logistic regression odds ratio</td>
<td>1.33 (0.58-3.04)</td>
<td>NS</td>
</tr>
<tr>
<td>Burt, S. 2011</td>
<td>Moderate</td>
<td>N= 448 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Peak force match cat 3 versus 1</td>
<td>Model 1 Peak force match cat 2 versus 1, Peak force match cat 3 versus 1, Exerts/min cat 2 versus 1 if BMI&lt;30, Exerts/min cat 3 versus 1 if BMI&lt;30, Exerts/min cat 2 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, Exerts/min cat 3 versus 1 if BMI&gt;=30, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;1, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;1, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;1, BMI&gt;=30 versus &lt;30 if exerts/min cat&lt;1</td>
<td>logistic regression odds ratio</td>
<td>2.74 (1.32-5.68)</td>
<td>highest level of peak force increases the odds of CTS versus the lowest level of peak force</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML,</td>
<td>Forceful gripping in most recent job age, BMI, Gender/Sex, med history, pregnancy, history of</td>
<td>or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools,</td>
<td>Logistical Regression</td>
<td>2.70 (1.26, 5.78)</td>
<td>increased odds of CTS for those conducting forceful activities (lifting and gripping)</td>
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<tr>
<td></td>
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<td>employers and three construction trade unions between July 2004 and</td>
<td>MUDS, DSL) at 3 years</td>
<td>CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies</td>
<td>forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>OR</td>
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<td>October 2006 into the PrediCTS study</td>
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<td>(NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping,</td>
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<td></td>
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<td>thumb pressing, finger pinching</td>
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### TABLE 62 RISK FACTOR: FRACTURE

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Dyer,G. 2008</td>
<td>Low</td>
<td>N= 100; all had fractures associated with the distal radius</td>
<td>progressive numbness in the median nerve distribution with or without weakness of palmar abduction</td>
<td>fracture translation percentage</td>
<td>matched by: age and Gender/Sex; covariates: all bivariate associations with P values over .08 were excluded from multivariate model</td>
<td>logistic</td>
<td>.26 p=.02</td>
<td>percent distal radius fracture translation increases the odds of CTS</td>
</tr>
<tr>
<td>Geoghegan,J.M.</td>
<td>Moderate</td>
<td>N= 190; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>Wrist fracture</td>
<td>matched by: age, gender/sex, and general practice; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic</td>
<td>2.29 (1.67–3.12)</td>
<td>wrist fracture patients at higher odds of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Morgenstern, H. 1991</td>
<td>Moderate</td>
<td>N= 1049; grocery store checkers belonging to local California union</td>
<td>symptoms of CTS indicated in questionnaire</td>
<td>history of broken wrist</td>
<td>matched by: all members were members of union food and commercial workers union; covariates: age, hours per work week, years worked, age*years worked interaction, use of laser scanner to check items, unload basket before checking, load and lift grocery bags after checking, currently pregnant, contraceptive use, use of exogenous estrogen, use of diuretics, history of broken wrist</td>
<td>logistic regression odds ratio</td>
<td>1.13 (0.54, 2.37)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>Gender/Sex: male vs female</td>
<td>model 2 best fitting model: age, Gender/SEX, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>1.13(.64-2.02)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2013</td>
<td>High</td>
<td>N= 2492 ; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms at 3 years</td>
<td>being female vs male</td>
<td>Gender/sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>2.37 (1.83, 3.06)</td>
<td>females are at higher risk of CTS symptoms</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2013</td>
<td>High</td>
<td>N= 2299 ; part of Observational Prospective Unified Study (OCTOPUS), enrolled workers in large and small domestic appliance, underwear, ceramic tile and shoe factories</td>
<td>CTS symptoms and NCS test at 3 years</td>
<td>being female vs male</td>
<td>Gender/sex, age, BMI personal history of diseases predisposing to CTS (diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure)</td>
<td>incident rate ratio from Poisson regression</td>
<td>2.85 (1.51, 5.37)</td>
<td>being female increases risk of CTS</td>
</tr>
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</table>

**TABLE 63 RISK FACTOR: GENDER/SEX (F)**
<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Evanoff,B. 2014</td>
<td>High</td>
<td>711 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Female Gender/Sex</td>
<td>adjusted for age, Gender/Sex, and BMI, past diagnosis of CTS or other upper extremity peripheral neuropathy, had a pacemaker or internal defibrillator, or were pregnant at the time of enrollment excluded</td>
<td>Multivariable mixed logistic regression models OR</td>
<td>1.09 (0.49,2.43)</td>
<td>NS</td>
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<tr>
<td>Bland,J.D. 2005</td>
<td>Low</td>
<td>N= 4155 ; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>Gender/Sex: female vs male</td>
<td>Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>1.11(0.96,1.27)</td>
<td>NS</td>
</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 456 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Gender/Sex female vs male at the mean hand activity level</td>
<td>Model 2: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex</td>
<td>logistic regression odds ratio</td>
<td>2.21 (1.17-4.15)</td>
<td>females are at higher CTS odds</td>
</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 455 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Gender/Sex female vs male at the mean hand activity level</td>
<td>Model 3: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex female vs male at the mean hand activity level</td>
<td>logistic regression odds ratio</td>
<td>1.77 (0.99-3.17)</td>
<td>NS</td>
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<tr>
<td>Study</td>
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<tr>
<td>Eleftheriou,A. 2012</td>
<td>Moderate</td>
<td>N= 441 ; 548 workers of a Governmental data entry &amp; processing unit</td>
<td>personal history of CTS or newly diagnosed CTS with CTS-7 algorithm score of 12 or more</td>
<td>Gender/sex (female vs male)</td>
<td>Keyboard strokes, gender/sex, physical activity, age</td>
<td>logistic regression OR</td>
<td>OR 4.08 (1.51 to 11.04)</td>
<td>females have greater odds of CTS</td>
</tr>
<tr>
<td>Shin,J. 2008</td>
<td>Moderate</td>
<td>N= 123 ; All were hemodialysis patients</td>
<td>pain or pain in median nerve distribution and Tinel's sign</td>
<td>Gender/Sex</td>
<td>age, gender/sex, predialysis plasma BMG level in 1990, duration of dialysis</td>
<td>logistic regression OR</td>
<td>OR 0.89(0.05,15.51)</td>
<td>NS</td>
</tr>
<tr>
<td>Silverstein,B.A. 1987</td>
<td>Moderate</td>
<td>N= 652 ; workers form seven different industrial sites</td>
<td>based on phalen and tinel's signs and symptoms mentioned in interview</td>
<td>Gender/Sex</td>
<td>Gender/Sex, age, years on job, work repetition, level of force involved in job, dummy variables controlling for job center effects</td>
<td>logistic regression OR</td>
<td>OR 1.17(0.29,4.69)</td>
<td>NS</td>
</tr>
<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>Female Gender/Sex</td>
<td>gender/sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>OR 4.0 (2.3–6.7)</td>
<td>Odds of CTS were significantly greater in Females</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>Estirado de, Cabo E. 2003</td>
<td>Low</td>
<td>N= 727 ; all patients had toxic oil syndrome</td>
<td>some were previously diagnosed by physician, others were diagnosed with electrodiagnostic tests and Tinel’s and/or Phalen’s sign at 9 years</td>
<td>Toxic Oil Syndrome (TOS) with concomitant neuropathy vs toxic oil syndrome alone</td>
<td>Model1 (all patients):TOS with Neuropathy, TOS with Thromboembolic events, TOS with scleroderma, smoking</td>
<td>logistic regression odds ratio</td>
<td>3.32(1.47-7.5)</td>
<td>TOS patients with Neuropathy were at higher odds of CTS than TOS patients without neuropathy</td>
</tr>
<tr>
<td>Estirado de, Cabo E. 2003</td>
<td>Low</td>
<td>N= 727 ; all patients had toxic oil syndrome</td>
<td>some were previously diagnosed by physician, others were diagnosed with electrodiagnostic tests and Tinel’s and/or Phalen’s sign at 9 years</td>
<td>Toxic Oil Syndrome (TOS) with concomitant Thromboembolic events vs toxic oil syndrome alone</td>
<td>Model1 (all patients):TOS with Neuropathy, TOS with Thromboembolic events, TOS with scleroderma, smoking</td>
<td>logistic regression odds ratio</td>
<td>2.85(1.14-7.13)</td>
<td>TOS patients with thromboembolic events were at higher odds of CTS than TOS patients without thromboembolic events</td>
</tr>
<tr>
<td>Estirado de, Cabo E. 2003</td>
<td>Low</td>
<td>N= 727 ; all patients had toxic oil syndrome</td>
<td>some were previously diagnosed by physician, others were diagnosed with electrodiagnostic tests and Tinel’s and/or Phalen’s sign at 9 years</td>
<td>Toxic Oil Syndrome (TOS) with concomitant scleroderma vs toxic oil syndrome alone</td>
<td>Model1 (all patients):TOS with Neuropathy, TOS with Thromboembolic events, TOS with scleroderma, smoking</td>
<td>logistic regression odds ratio</td>
<td>.43(.24-.8)</td>
<td>TOS patients with scleroderma were at lower odds of CTS than TOS patients without scleroderma</td>
</tr>
<tr>
<td>Estirado de, Cabo E. 2003</td>
<td>Low</td>
<td>N= 727 ; all patients had toxic oil syndrome</td>
<td>some were previously diagnosed by physician, others were diagnosed with electrodiagnostic tests and Tinel’s and/or Phalen’s sign at 9 years</td>
<td>TOS patients with fibrositis vs TOS patients without Fibrositis</td>
<td>Model1 (all patients):TOS with Neuropathy, TOS with Thromboembolic events, TOS with scleroderma, smoking</td>
<td>logistic regression odds ratio</td>
<td>NR</td>
<td>NS</td>
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<td>Study</td>
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<tr>
<td>Estirado de, Cabo E. 2003</td>
<td>Low</td>
<td>N= 495 ; all female patients had toxic oil syndrome</td>
<td>some were previously diagnosed by physician, others were diagnosed with electrodiagnostic tests and Tinel's and/or Phalen’s sign at 9 years</td>
<td>TOS women with fibrositis vs TOS women without Fibrositis</td>
<td>Model 2: female patients with fibrosis (as covariate)TOS with Neuropathy, TOS with Thromboembolic events, TOS with scleroderma, smoking, fibrosis</td>
<td>logistic regression odds ratio</td>
<td>2.53(1.06-3.2)</td>
<td>women with fibrositis and TOS are at higher odds of CTS than TOS women without fibrosis</td>
</tr>
<tr>
<td>Estirado de, Cabo E. 2003</td>
<td>Low</td>
<td>N= 495 ; all female patients had toxic oil syndrome</td>
<td>some were previously diagnosed by physician, others were diagnosed with electrodiagnostic tests and Tinel's and/or Phalen’s sign at 9 years</td>
<td>TOS women who had miscarriages vs women with TOS who did not have a miscarriage</td>
<td>Model 3: female TOS with miscarriages (as a covariate) with Neuropathy, TOS with Thromboembolic events, TOS with scleroderma, smoking, miscarriages</td>
<td>logistic regression odds ratio</td>
<td>1.84(1.04-3.2)</td>
<td>women who had miscarriages and have TOS are at higher odds of CTS than TOS women who did not have a miscarriage</td>
</tr>
<tr>
<td>Keese,G.R. 2006</td>
<td>Low</td>
<td>N= 72 ; CTS cases and control patients selected from one clinic</td>
<td>symptoms and neurodiagnostic test at 6 months</td>
<td>bilateral agenesis vs none</td>
<td>matched by: age, Gender/Sex, industrial exposures, diabetes, thyroid disease, alcohol abuse and rheumatoid arthritis ; covariates: bilateral agenesis vs none</td>
<td>odds ratio</td>
<td>0.23(0.024, 2.167)</td>
<td>ns</td>
</tr>
<tr>
<td>Keese,G.R. 2006</td>
<td>Low</td>
<td>N= 72 ; CTS cases and control patients selected from one clinic</td>
<td>symptoms and neurodiagnostic test at 6 months</td>
<td>unilateral agenesis vs none</td>
<td>matched by: age, Gender/Sex, industrial exposures, diabetes, thyroid disease, alcohol abuse and rheumatoid arthritis ; covariates: unilateral agenesis vs none</td>
<td>odds ratio</td>
<td>.099(.005, 1.909)</td>
<td>odds are higher in patients with unilateral agenesis</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>Kopec,J. 2011</td>
<td>Low</td>
<td>N= 386 ; all patients were on hemodialysis</td>
<td>signs and symptoms verified by nerve conduction studies</td>
<td>presence of Anti-HCV antibodies</td>
<td>presence of Anti-HCV antibodies</td>
<td>p value from chi squared test</td>
<td>&lt;.00001</td>
<td>presence of anti-hcv antibodies increased the odds of CTS</td>
</tr>
<tr>
<td>Vogelsang,L.M. 1994</td>
<td>Low</td>
<td>N= 100 ; all were worked in what were considered high risk occupations(automotive parts or assembly workers, keyboard operators, electronics industry workers, and garment industry workers from East Tennessee, and sign language interpreters). Each case was matched by age, Gender/Sex, race/ethnicity, height, weight, body type, length of time, job duties</td>
<td>diagnosed by orthopaedist</td>
<td>RMC, Related Medical Conditions</td>
<td>social readjustment scale, self-control schedule, life style approaches scale, self-control questionnaire, perceived stress scales, Cohen-Hoberman Inventory of Physical Symptoms, related medical condition, suspected medical risk, related musculoskeletal problems</td>
<td>p value logistic regression</td>
<td>&lt;.05</td>
<td>patients with CTS were more likely to have related medical conditions</td>
</tr>
<tr>
<td>Study</td>
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<td>Vogelsang, L.M. 1994</td>
<td>Low</td>
<td>N= 100 ; all were worked in what were considered high risk occupations (automotive parts or assembly workers, keyboard operators, electronics industry workers, and garment industry workers from East Tennessee, and sign language interpreters). Each case was matched by age, Gender/Sex, race/ethnicity, height, weight, body type, length of time, job duties</td>
<td>diagnosed by orthopaedist</td>
<td>MR, Suspected Medical Risk factors related to CTS</td>
<td>social readjustment scale, self-control schedule, life style approaches scale, self-control questionnaire, perceived stress scales, Cohen-Hoberman Inventory of Physical Symptoms, related medical condition, suspected medical risk, related musculoskeletal problems</td>
<td>p value logistic regression</td>
<td>&gt; .05</td>
<td>NS</td>
</tr>
<tr>
<td>Burt, S. 2011</td>
<td>Moderate</td>
<td>N= 455 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>High blood pressure vs no</td>
<td>Model 3: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex female vs male at the mean hand activity level</td>
<td>logistic regression odds ratio</td>
<td>1.89 (1.01-3.53)</td>
<td>High blood pressure increases CTS odds</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<tr>
<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>other diseases(diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma) vs none</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>1.47 (0.45-4.79)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>Hakim,A.J. 2002</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>monozygotic vs dizygotic twins(supposed to be a measure of genetic risk of CTS)</td>
<td>matched by: pairs of twins ; covariates: age, height, weight, menopausal status, and physical activity</td>
<td>heritability statistic</td>
<td>.47(.34, .59)</td>
<td>47 percent of the variation in CTS diagnoses was attributable to whether the twins in this population were monozygotic as opposed to dizygotic</td>
</tr>
<tr>
<td>Bland,J.D. 2005</td>
<td>Low</td>
<td>N= 4155 ; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>Family history</td>
<td>Gender/Sex, smoking, age, BMI*age interaction</td>
<td>logistic regression OR</td>
<td>1.11(0.91,1.34)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS symptoms</td>
<td>CTS familiar history</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>1.68(0.74–3.82)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS diagnosis with clinical and electrodagnostic examinations</td>
<td>CTS familiar history</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>3.6(1.20–10.75)</td>
<td>CTS family history increases risk</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
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<td>CTS Diagnostics</td>
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<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 456 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Hand Activity Level among females</td>
<td>Model 2: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex</td>
<td>logistic regression odds ratio</td>
<td>1.03 (0.83-1.28)</td>
<td>NS</td>
</tr>
<tr>
<td>Burt,S. 2011</td>
<td>Moderate</td>
<td>N= 456 ; healthcare and manufacturing workers</td>
<td>electrodiagnostic tests, hand diagram and symptoms</td>
<td>Hand Activity Level among males</td>
<td>Model 2: peak worker perceived exertion rating (0-10), BMI, Hand Activity Level among females, Hand Activity Level among males, Gender/Sex</td>
<td>logistic regression odds ratio</td>
<td>1.38 (1.05-1.81)</td>
<td>Higher hand activity level increases the odds of CTS</td>
</tr>
<tr>
<td>Nordstrom,D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Parent, child, or sibling had CTS</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>1.87 (0.97, 3.60)</td>
<td>NS</td>
</tr>
<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>family history (yes versus no)</td>
<td>gender/sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>1.2 (0.7–2.0)</td>
<td>NS</td>
</tr>
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<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers,</td>
<td>using forceful hand grip</td>
<td>model 1: age, Gender/ Sex, body mass</td>
<td>logistic regression OR</td>
<td>1.68 (1.12, 2.53)</td>
<td>using forceful hand grip is associated with higher odds of median neuropathy</td>
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<td>laboratory workers, computer workers, and hospital support staff.</td>
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<td>index, wrist index, history of diabetes,</td>
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<td>and history of shoulder tendonitis,</td>
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<td>lifting more than 2lbs/day, using</td>
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<td>vibrating tools, assembly line work,</td>
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<td>twisting forearm work, bending wrist</td>
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<td>work, using forceful hand grip, using</td>
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<td>fingers/thumb as pressing tool, using</td>
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<td>fingers in a pinch grip</td>
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<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers,</td>
<td>using fingers in pinch grip</td>
<td>model 1: age, Gender/ Sex, body mass</td>
<td>logistic regression OR</td>
<td>1.24 (0.82, 1.86)</td>
<td>NS</td>
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<tr>
<td></td>
<td></td>
<td>laboratory workers, computer workers, and hospital support staff.</td>
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<td>index, wrist index, history of diabetes,</td>
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<td>and history of shoulder tendonitis,</td>
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<td>lifting more than 2lbs/day, using</td>
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<td>vibrating tools, assembly line work,</td>
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<td>twisting forearm work, bending wrist</td>
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<td>work, using forceful hand grip, using</td>
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<td>fingers/thumb as pressing tool, using</td>
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<td></td>
<td>fingers in a pinch grip</td>
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<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Dale, A.M.</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>peak exposure to Forceful gripping</td>
<td>age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>2.21 (1.03, 4.73)</td>
<td>increased risk of CTS for those conducting forceful activities (lifting and gripping)</td>
</tr>
<tr>
<td>Evanoff, B.</td>
<td>Moderate</td>
<td>N= 745 ; newly employed workers</td>
<td>symptoms and NCS at 3 years</td>
<td>pinch grip</td>
<td>age, Gender/Sex, lifting at least 1kg, forceful grip, finger/thumb pressing, using vibrating tools, pinch grip, forearm rotation, hand/wrist bending</td>
<td>NR</td>
<td>NR</td>
<td>NS</td>
</tr>
<tr>
<td>Evanoff, B.</td>
<td>Moderate</td>
<td>N= 745 ; newly employed workers</td>
<td>symptoms and NCS at 3 years</td>
<td>forceful gripping</td>
<td>age, Gender/Sex, lifting at least 1kg, forceful grip, finger/thumb pressing, using vibrating tools, pinch grip, forearm rotation, hand/wrist bending</td>
<td>logistic regression odds ratio</td>
<td>2.59(1.12-5.99)</td>
<td>forceful gripping increases CTS odds</td>
</tr>
</tbody>
</table>
**TABLE 67 RISK FACTOR: HEIGHT**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violante, F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.)</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>tall height with short forearm length versus short height and short forearm length (tall/long=50th percentile or higher)</td>
<td>gender/sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tenosynovitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression</td>
<td>0.5 (0.3–0.9)</td>
<td>being tall with a short forearm significantly decreases odds of CTS compared to short stature with short forearm</td>
</tr>
</tbody>
</table>
### TABLE 68 RISK FACTOR: HOBBIES

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garg, A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>Gardening</td>
<td>Model 1: ACGIH Hand Activity Level (HAL), age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>Cox</td>
<td>3.02 (1.28–7.15)</td>
<td>gardening is a risk factor for CTS</td>
</tr>
<tr>
<td>Garg, A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>Gardening</td>
<td>Model 2: strain index, age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>Cox</td>
<td>3.17 (1.34–7.46)</td>
<td>gardening is a risk factor for CTS</td>
</tr>
<tr>
<td>Hakim, A.J. 2002</td>
<td>High</td>
<td>N= 3674 ; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Leisure activity (low vs. high level)</td>
<td>matched by: pairs of twins; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>Logit regression with adjustment for pair codependency</td>
<td>1(0.80–1.26)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Tang,X. 1999</td>
<td>Low</td>
<td>N= 122 ; female cases and controls recruited from one hospital neurology department</td>
<td>CTS signs and symptoms with selective abnormalities of the MN conduction distal to the wrist that showed slowing compared to a separately cited average values from another population</td>
<td>duration knitting hours per week</td>
<td>matched by: age and diabetes ; covariates: duration knitting hours per week</td>
<td>odds ratio</td>
<td>1</td>
<td>NS</td>
</tr>
<tr>
<td>Tang,X. 1999</td>
<td>Low</td>
<td>N= 122 ; female cases and controls recruited from one hospital neurology department</td>
<td>CTS signs and symptoms with selective abnormalities of the MN conduction distal to the wrist that showed slowing compared to a separately cited average values from another population</td>
<td>knitting more than 2 hours per week</td>
<td>matched by: age and diabetes ; covariates: knitting more than 2 hours per week</td>
<td>odds ratio</td>
<td>1.13(0.57,2.22)</td>
<td>NS</td>
</tr>
<tr>
<td>Ali,K.M. 2006</td>
<td>Moderate</td>
<td>N= 648 ; computer professionals from 21 companies</td>
<td>Phalen’s and Tinel’s test</td>
<td>internet use</td>
<td>age, Gender/Sex, smoking, alcohol use, BMI, years of computer work, hours of computer work per day, system administrator job vs other job functions, and internet use in leisure time</td>
<td>logistic regression odds ratio</td>
<td>1.7(1.2,2.7)</td>
<td>internet use increases odds of CTS</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS symptoms</td>
<td>Hand-knitting/needlework</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>2.21(1.09–4.47)</td>
<td>people who hand-knit/do needle work are at higher odds for CTS symptoms</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Bonfiglioli, R. 2007</td>
<td>Moderate</td>
<td>N= 269; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS diagnosis with clinical and electrodiagnostic examinations</td>
<td>Hand-knitting/needlework</td>
<td>work (cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>2(0.68–5.87)</td>
<td>NS</td>
</tr>
<tr>
<td>Eleftheriou, A. 2012</td>
<td>Moderate</td>
<td>N= 441; 548 workers of a Governmental data entry &amp; processing unit</td>
<td>personal history of CTS</td>
<td>history of physical activity (yes vs no)</td>
<td>Keyboard strokes, age, physical activity, smoking</td>
<td>logistic regression OR</td>
<td>0.38 (0.16 to 0.87)</td>
<td>history of physical activity is associated with lower risk of CTS</td>
</tr>
<tr>
<td>Eleftheriou, A. 2012</td>
<td>Moderate</td>
<td>N= 441; 548 workers of a Governmental data entry &amp; processing unit</td>
<td>personal history of CTS or newly diagnosed CTS with CTS-7 algorithm score of 12 or more</td>
<td>history of physical activity (yes vs no)</td>
<td>Keyboard strokes, gender/sex, physical activity, age</td>
<td>logistic regression OR</td>
<td>0.72 (0.44 to 1.20)</td>
<td>NS</td>
</tr>
<tr>
<td>Goodson, J.T. 2014</td>
<td>Moderate</td>
<td>87 CTS and 74 sex-matched general orthopedic patients from an outpatient orthopedic clinic in the Western US.</td>
<td>(1) Electrodiagnostic (EDX) testing results suggestive of abnormal slowing of the median nerve, (2) the presence of clinical symptoms of CTS, and (3) no confounding syndromes/disorders</td>
<td>vigorous exercise</td>
<td>excluded confounding conditions; gender/sex, age, education levels, ethnicity, and EDX testing results</td>
<td>Logistical Regression OR</td>
<td>0.997(0.995,0.999)</td>
<td>Vigorous exercise decreases odds</td>
</tr>
<tr>
<td>Goodson, J.T. 2014</td>
<td>Moderate</td>
<td>87 CTS and 74 sex-matched general orthopedic patients from an outpatient orthopedic clinic in the Western US.</td>
<td>(1) Electrodiagnostic (EDX) testing results suggestive of abnormal slowing of the median nerve, (2) the presence of clinical symptoms of CTS, and (3) no confounding syndromes/disorders</td>
<td>physical activities with wrist strain</td>
<td>excluded confounding conditions; gender/sex, age, education levels, ethnicity, and EDX testing results</td>
<td>Logistical Regression OR</td>
<td>1.002(1.1.004)</td>
<td>physical activity that involves wrist strain increases odds of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>hobbies (including motorcycle riding) vs none</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>1.73 (0.75-3.98)</td>
<td>NS</td>
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</table>
### TABLE 69 RISK FACTOR: HOSPITAL WORK

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong, T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>hospital vs clerical work</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>2.42 (0.96, 6.09)</td>
<td>NS</td>
</tr>
</tbody>
</table>
### TABLE 70 RISK FACTOR: HOUSEWORK

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td>Hakim, A.J. 2002</td>
<td>High</td>
<td>N= 3674; twins from the UK Adult Twin Registry</td>
<td>hand diagram: classic or probable CTS</td>
<td>Home activity (low vs. high level)</td>
<td>matched by: pairs of twins; covariates: age, BMI, home activity level, leisure activity level, clerical vs not clerical occupation, menopausal status, hysterectomy, use of hormone replacement therapy, current use of thyroxine replacement therapy</td>
<td>logit regression odds ratio with adjustment for pair codependency</td>
<td>1.21(0.95–1.55)</td>
<td>NS</td>
</tr>
<tr>
<td>Tang, X. 1999</td>
<td>Low</td>
<td>N= 122; female cases and controls recruited from one hospital neurology department</td>
<td>CTS signs and symptoms with selective abnormalities of the MN conduction distal to the wrist that showed slowing compared to a separately cited average values from another population</td>
<td>washing clothes manually more than 2 hours per week</td>
<td>matched by: age and diabetes; covariates: washing clothes manually more than 2 hours per week</td>
<td>odds ratio</td>
<td>3.86(1.79,8.33)</td>
<td>washing clothes manually more than 2 hours per week increase odds of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Tang, X. 1999</td>
<td>Low</td>
<td>N= 122 ; female cases and controls recruited from one hospital neurology department</td>
<td>CTS signs and symptoms with selective abnormalities of the MN conduction distal to the wrist that showed slowing compared to a separately cited average values from another population</td>
<td>continuous duration of washing clothes per week</td>
<td>matched by: age and diabetes ; covariates: continuous duration of washing clothes per week</td>
<td>odds ratio</td>
<td>2.33(0.63-8.64)</td>
<td>NS</td>
</tr>
</tbody>
</table>
| Tang, X. 1999 | Low     | N= 122 ; female cases and controls recruited from one hospital neurology department | CTS signs and symptoms with selective abnormalities of the MN conduction distal to the wrist that showed slowing compared to a separately cited average values from another population | kneading or rolling dough manually more than 2 hours per week | matched by: age and diabetes ; covariates: kneading or rolling dough manually more than 2 hours per week | odds ratio | 6.25(2.5,15.63)     | kneading or rolling dough more than 2 hours per week increases odds of CTS
<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tang,X. 1999</td>
<td>Low</td>
<td>N= 122 ; female cases and controls recruited from one hospital neurology department</td>
<td>CTS signs and symptoms with selective abnormalities of the MN conduction distal to the wrist that showed slowing compared to a separately cited average values from another population</td>
<td>continuous duration of kneading or rolling dough per week</td>
<td>matched by: age and diabetes ; covariates: continuous duration of kneading or rolling dough per week</td>
<td>odds ratio</td>
<td>1.88(0.81,4.38)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS symptoms</td>
<td>Children</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>1.61(0.83–3.13)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS diagnosis with clinical and electrodiagnostic examinations</td>
<td>Children</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>2.16(0.67–6.95)</td>
<td>the presence of children increases odds of CTS</td>
</tr>
</tbody>
</table>
### TABLE 71 RISK FACTOR: INDUSTRIAL

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jenkins, P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Process, plant, and machine operatives vs. Associate professional and technical occupations</td>
<td>matched by: all males; covariates: Process, plant, and machine operatives vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>2.69 (1.58–4.76)</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Jenkins, P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Process, plant, and machine operatives vs. Associate professional and technical occupations</td>
<td>matched by: all females; covariates: Process, plant, and machine operatives vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>1.99 (1.12–3.51)</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Leclerc, A. 1998</td>
<td>Low</td>
<td>N= 601; clothing and shoe (non-packaging) workers and non-repetitive workers (cleaning, maintenance or catering jobs)</td>
<td>Tinel or phalen test positive or nerve condition velocity had been established before medical examination</td>
<td>clothing and shoe industry (non-packaging) vs non repetitive work (cleaning, maintenance and catering)</td>
<td>matched by: all were of similar education level; covariates: gender/sex, age, psychological problems, BMI</td>
<td>logistic regression odds ratio</td>
<td>4.12 (1.95 to 8.71)</td>
<td>odds of CTS are significantly higher in clothing and shoe industry workers</td>
</tr>
<tr>
<td>Leclerc, A. 1998</td>
<td>Low</td>
<td>N= 644; food industry (non-packaging) workers and non-repetitive workers (or catering jobs)</td>
<td>Tinel or phalen test positive or nerve condition velocity had been established before medical examination</td>
<td>food industry workers (non-packaging) vs non repetitive work (cleaning, maintenance and catering)</td>
<td>matched by: all were of similar education level; covariates: gender/sex, age, psychological problems, BMI</td>
<td>logistic regression odds ratio</td>
<td>3.14 (1.38 to 7.15)</td>
<td>odds of CTS are significantly higher in food (non-packaging) workers</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Leclerc,A. 1998</td>
<td>Low</td>
<td>N= 497 ; packaging workers and non-repetitive workers(or catering jobs)</td>
<td>Tinel or phalen test positive or nerve condition velocity had been established before medical examination</td>
<td>packaging workers vs non repetitive work (cleaning, maintenance and catering)</td>
<td>matched by: all were of similar education level ; covariates: gender/sex, age, psychological problems, BMI</td>
<td>logistic regression odds ratio</td>
<td>6.55 (3.02 to 14.2)</td>
<td>odds of CTS are significantly higher in packaging workers</td>
</tr>
<tr>
<td>Roquelaure,Y. 2008</td>
<td>Moderate</td>
<td>N= 194276 ; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Blue-collar workers vs unemployed</td>
<td>matched by: among women ; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>3.0 [2.5-3.6]</td>
<td>risk significantly higher than in the unemployed</td>
</tr>
<tr>
<td>Roquelaure,Y. 2008</td>
<td>Moderate</td>
<td>N= 193802 ; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Blue-collar workers vs unemployed</td>
<td>matched by: among men ; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>4.2 [3.3-5.5]</td>
<td>risk significantly higher than in the unemployed</td>
</tr>
</tbody>
</table>
**TABLE 72 RISK FACTOR: JOB CONTROL**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>little job control in work done, in timetables, or breaks</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression OR</td>
<td>1.4 (1.1-2.0)</td>
<td>odds higher in patients with little job control</td>
</tr>
<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>job includes targets, bonuses or deadlines</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression OR</td>
<td>1.2 (0.9-1.7)</td>
<td>NS</td>
</tr>
<tr>
<td>Nordstrom,D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>IOSH Job control (0=least) 2.8-3.4 vs1-2.7</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>1.05 (0.48, 2.27)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>Nordstrom,D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>IOSH Job control (0=least) 3.6-3.8 vs1-2.7</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>0.34 (0.14, 0.82)</td>
<td>higher job control associated with lower CTS odds</td>
</tr>
<tr>
<td>Nordstrom,D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>IOSH Job control (0=least) 4.4 vs1-2.7</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>0.64 (0.29, 1.42)</td>
<td>NS</td>
</tr>
<tr>
<td>Nordstrom,D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>IOSH Job control (0=least) 4.6-4.8 vs1-2.7</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>0.35 (0.14, 0.91)</td>
<td>higher job control associated with lower CTS odds</td>
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**TABLE 73 RISK FACTOR: LACK OF COWORKER SUPPORT**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Werner, R.A.</td>
<td>Low</td>
<td>N= 189; all were automobile assembly line workers</td>
<td>hand diagram symptoms, and median sensory evoked response that .5 msec longer than ipsilateral ulnar sensory response at 1 year</td>
<td>coworker support level</td>
<td>Gender/Sex, wrist/hand tendonitis, diabetes, coworker support, median ulnar peak latency on dominant side, elbow posture rating</td>
<td>logistic regression odds ratio</td>
<td>.69 (.48, .99)</td>
<td>higher levels of coworker support was associated with lower odds of CTS</td>
</tr>
<tr>
<td>Coggon, D.</td>
<td>Moderate</td>
<td>N= 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>little level of support from supervisors or colleagues</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression OR</td>
<td>1.6 (1.1-2.3)</td>
<td>odds higher in patients with little level of support</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<td>Significance</td>
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<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS symptoms</td>
<td>Previous at-risk jobs</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>1.01(0.94–1.09)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS diagnosis with clinical and electrodiagnostic examinations</td>
<td>Previous at-risk jobs</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>0.95(0.84–1.07)</td>
<td>NS</td>
</tr>
<tr>
<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>same job with previous employers yes vs no</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>12.15 (2.96–49.93)</td>
<td>patients who had same floor cleaner job with a previous employer had greater odds of CTS than those who did not have same job at previous employer</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Nordstrom, D.L., 1997</td>
<td>Moderate</td>
<td>N= 417; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Worked 4880-5383 vs 2954 hours</td>
<td>matched by: age; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>0.29 (0.12, 0.72)</td>
<td>more hours worked since 1993 was associated with lower odds of CTS</td>
</tr>
<tr>
<td>Nordstrom, D.L., 1997</td>
<td>Moderate</td>
<td>N= 417; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Worked 6647-15510 vs 2954 hours</td>
<td>matched by: age; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>0.29 (0.10, 0.78)</td>
<td>more hours worked since 1993 was associated with lower odds of CTS</td>
</tr>
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</table>
TABLE 75 RISK FACTOR: LEVEL OF SATISFACTION

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goodson, J.T. 2014</td>
<td>Moderate</td>
<td>87 CTS and 74 gender/sex-matched general orthopedic patients from an outpatient orthopedic clinic in the Western US.</td>
<td>(1) Electrodiagnostic (EDX) testing results suggestive of abnormal slowing of the median nerve, (2) the presence of clinical symptoms of CTS, and (3) no confounding syndromes/disorders</td>
<td>Job Satisfaction</td>
<td>excluded confounding conditions; gender/sex, age, education levels, ethnicity, and EDX testing results</td>
<td>Logistical Regression OR</td>
<td>0.66(0.5,0.88)</td>
<td>Job satisfaction decreases odds of CTS</td>
</tr>
</tbody>
</table>
TABLE 76 RISK FACTOR: LIFTING

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<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>lifting 2 or more pounds/day</td>
<td>model 1: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, using vibrating tools, assembly line work, twisting forearm work, bending wrist work, using forceful hand grip, using fingers/thumb as pressing tool, using fingers in a pinch grip</td>
<td>logistic regression OR</td>
<td>3.31 (1.54, 7.12)</td>
<td>lifting 2 or more pounds/day significantly increases CTS odds</td>
</tr>
<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>lifting 2 or more pounds/day</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>2.67 (1.21, 5.88)</td>
<td>lifting 2 or more pounds/day is associated with higher odds of median neuropathy</td>
</tr>
<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>peak exposure to lifting objects</td>
<td>age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>3.61 (1.41, 9.24)</td>
<td>Peak exposure to lifting increases odds of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
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<tr>
<td>Dale, A.M.</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Lifting objects in most recent job</td>
<td>age, BMI, Gender/sex, medical history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>2.98 (1.41, 6.31)</td>
<td>Lifting increases odds</td>
</tr>
<tr>
<td>Evanoff, B.</td>
<td>Moderate</td>
<td>N= 745; newly employed workers symptoms and NCS at 3 years</td>
<td>lifting more than 1 kg/day</td>
<td>age, Gender/sex, lifting at least 1 kg, forceful grip, finger/thumb pressing, using vibrating tools, pinch grip, forearm rotation, hand/wrist bending</td>
<td>logistic regression odds ratio</td>
<td>3.27 (1.27, 8.44)</td>
<td>lifting at least 1 kg increases CTS odds</td>
<td></td>
</tr>
<tr>
<td>Nathan, P.A.</td>
<td>Moderate</td>
<td>N= 148; industrial workers in Portland Oregon area clinical and electrodiagnostic tests at 15-16 years</td>
<td>heavy lifting</td>
<td>repetitious movement, heavy lifting, keyboard use, vibration tools, force, cigarette use, Gender/sex, age, BMI</td>
<td>logistic regression odds ratio</td>
<td>1.31 (p-value=.63)</td>
<td>NS</td>
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### TABLE 77 RISK FACTOR: MANAGERIAL JOBS

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Jenkins,P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Managers, directors, and senior officials vs. Associate professional and technical occupations</td>
<td>matched by: all males; covariates: Managers, directors, and senior officials vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>0.88 (0.43–1.77)</td>
<td>NS</td>
</tr>
<tr>
<td>Jenkins,P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Managers, directors, and senior officials vs. Associate professional and technical occupations</td>
<td>matched by: all females; covariates: Managers, directors, and senior officials vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>1.69 (0.99–2.91)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Kaplan,Y. 2008</td>
<td>Low</td>
<td>N= 221 ; all were postmenopausal women</td>
<td>NCS</td>
<td>marital status-married versus other</td>
<td>matched by: age matched females ; covariates: marital status</td>
<td>p-value</td>
<td>&gt;.05</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the mid-west</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>feeling down or blue or depressed never vs seldom</td>
<td>Model1: ACGIH Hand Activity Level (HAL), age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>0.08 (0.01–0.62)</td>
<td>depression/feeling down is associated with CTS</td>
</tr>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>feeling down or blue or depressed often vs seldom</td>
<td>Model1: ACGIH Hand Activity Level (HAL), age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>0.99 (0.44–2.24)</td>
<td>NS</td>
</tr>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>feeling down or blue or depressed always vs seldom</td>
<td>Model1: ACGIH Hand Activity Level (HAL), age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>8.19 (1.69–39.72)</td>
<td>depression/feeling down is associated with CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<td>Garg,A. 2012</td>
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<td>feeling down or blue or depressed never vs seldom</td>
<td>Model 2: strain index ,age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>0.10 (0.01–0.71)</td>
<td>depression/feeling down is associated with CTS</td>
</tr>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>feeling down or blue or depressed often vs seldom</td>
<td>Model 2: strain index ,age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>0.94 (0.42–2.12)</td>
<td>NS</td>
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<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>feeling down or blue or depressed always vs seldom</td>
<td>Model 2: strain index ,age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>8.44 1.73–41.16</td>
<td>depression/feeling down is associated with CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<tr>
<td>Roquelaure,Y. 2001</td>
<td>Low</td>
<td>N= 162 ; footwear factory workers</td>
<td>psychological distressed measured by G at 2 year</td>
<td>psychological distress measured by General Health Questionnaire (GHQ-12) greater or equal to 90th percentile</td>
<td>BMI over 30, GHQ-12 score, rapid trigger movements, work strongly controlled by superiors</td>
<td>logistic regression odds ratio</td>
<td>4.3 (1.0-18.6)</td>
<td>having high levels of psychological distress on the GHQ-12 (90th percentile) was associated with greater odds of CTS</td>
</tr>
<tr>
<td>Coggon,D. 2013 Moderate</td>
<td>N= 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>intermediate mental health vs good mental health</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression OR</td>
<td>1.3 (0.9-1.7)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Coggon,D. 2013 Moderate</td>
<td>N= 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>poor mental health vs good mental health</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression OR</td>
<td>1.4 (1.0-1.9)</td>
<td>odds higher in patients with poor mental health</td>
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### TABLE 80 RISK FACTOR: MODERATE ALCOHOL USE

<table>
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<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.)</td>
<td>occurrence within last month of “classic/probable” or “possible” symptoms of CTS</td>
<td>Moderate alcohol consumption (defined as 2 to 4 drinks per week)</td>
<td>gender/sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendinitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression OR</td>
<td>0.2 (0.1–1.0)</td>
<td>Moderate alcohol consumption decreases odds of CTS. Greater alcohol consumption did not significantly affect odds of CTS</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>1 to 2 distal upper extremity musculoskeletal disorders vs zero disorders</td>
<td>Model1: ACGIH Hand Activity Level (HAL) ,age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>2.45 (1.21–5.08)</td>
<td>more distal upper extremity musculoskeletal disorders is associated with higher CTS risk</td>
<td></td>
</tr>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>3 or more distal upper extremity musculoskeletal disorders vs zero disorders</td>
<td>Model1: ACGIH Hand Activity Level (HAL) ,age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>3.85 (1.08–13.8)</td>
<td>more distal upper extremity musculoskeletal disorders is associated with higher CTS risk</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<td>Stat. Type</td>
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<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>1 to 2 distal upper extremity musculoskeletal disorders vs zero disorders</td>
<td>Model 2: strain index , age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>2.66 (1.30–5.45)</td>
<td>more distal upper extremity musculoskeletal disorders is associated with higher CTS risk</td>
<td></td>
</tr>
<tr>
<td>Garg,A. 2012</td>
<td>High</td>
<td>N= 536 ; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>3 or more distal upper extremity musculoskeletal disorders vs zero disorders</td>
<td>Model 2: strain index , age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>3.70 (1.02–13.46)</td>
<td>more distal upper extremity musculoskeletal disorders is associated with higher CTS risk</td>
<td></td>
</tr>
<tr>
<td>Bayrak,I.K. 2008</td>
<td>Low</td>
<td>N= 290 ; CTS patients were from electrophysiology clinic, and controls were selected from patients who underwent ultrasound for other reasons</td>
<td>clinically and electrophysiologically</td>
<td>bifid median nerve</td>
<td></td>
<td>chi squared p value</td>
<td>&lt;.01</td>
<td>bifid median nerve was more frequent in CTS case patients than in control patients</td>
<td></td>
</tr>
<tr>
<td>Study Name</td>
<td>Quality</td>
<td>Sample Size</td>
<td>Population Details</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Statistical Method</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Keese, G.R., 2006</td>
<td>Low</td>
<td>N= 72; CTS cases and control patients selected from one clinic</td>
<td>Symptoms and neurodiagnostic test at 6 months</td>
<td>Palmaris long us present vs Absent</td>
<td>matched by: age, Gender/Sex, industrial exposures, diabetes, thyroid disease, alcohol abuse and rheumatoid arthritis; covariates: Palmaris long us present vs Absent</td>
<td>odds ratio</td>
<td>10(1.18, 84.779)</td>
<td>odds of CTS is significantly higher when Palmaris long us is present</td>
<td></td>
</tr>
<tr>
<td>Vogelsang, L.M., 1994</td>
<td>Low</td>
<td>N= 100; all were worked in what were considered high risk occupations (automotive parts or assembly workers, keyboard operators, electronics industry workers, and garment industry workers from East Tennessee, and sign language interpreters). Each case was matched by age, Gender/Sex, race/ethnicity, height, weight, body type, length of time, job duties</td>
<td>Diagnosed by orthopaedist</td>
<td>GMP, Generic Musculoskeletal Problems</td>
<td>social readjustment scale, self-control schedule, life style approaches scale, self-control questionnaire, perceived stress scales, Cohen-Hoberman Inventory of Physical Symptoms, related medical condition, suspected medical risk, related musculoskeletal problems</td>
<td>p value logistic regression</td>
<td>&lt;.05</td>
<td>patients with CTS were more likely to have related generic musculoskeletal problems besides CTS</td>
<td></td>
</tr>
<tr>
<td>Aktas, I., 2008</td>
<td>Moderate</td>
<td>N= 90; patients referred to electrophysiological laboratory</td>
<td>Electrophysiologically diagnosed</td>
<td>Benign joint hypermobility</td>
<td>Pearson’s correlation</td>
<td>0.59</td>
<td>joint hypermobility increases CTS risk</td>
<td></td>
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</tr>
<tr>
<td>Nordstrom, D.L., 1997</td>
<td>Moderate</td>
<td>N= 417; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Musculoskeletal condition</td>
<td>matched by: age; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>2.54 (1.03, 6.23)</td>
<td>Odds are greater in patients with musculoskeletal conditions</td>
<td></td>
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</table>
### TABLE 82 RISK FACTOR: OFFICE WORK

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roquelaure,Y. 2008</td>
<td>Moderate</td>
<td>N= 194276 ; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Lower-grade white-collar workers vs unemployed</td>
<td>matched by: among women ; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>2.5 [2.2-3.0]</td>
<td>risk significantly higher than in the unemployed</td>
</tr>
<tr>
<td>Roquelaure,Y. 2008</td>
<td>Moderate</td>
<td>N= 193802 ; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Lower-grade white-collar workers vs unemployed</td>
<td>matched by: among men ; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>1.3 [0.8-2.1]</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Jenkins,P.J. 2013</td>
<td>Low</td>
<td>N= unclear ; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Elementary occupations vs. Associate professional and technical occupations</td>
<td>matched by: all males ; covariates: Elementary occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>3.08 (1.78–5.51)</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Jenkins,P.J. 2013</td>
<td>Low</td>
<td>N= unclear ; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Elementary occupations vs. Associate professional and technical occupations</td>
<td>matched by: all females ; covariates: Elementary occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>4.85 (3.21–7.55)</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Kaplan,Y. 2008</td>
<td>Low</td>
<td>N= 221 ; all were postmenopausal women</td>
<td>NCS</td>
<td>home maker versus employed outside of home</td>
<td>matched by: age matched females ; covariates: homemaker versus employed</td>
<td>odds ratio</td>
<td>1.10 (0.64, 1.89)</td>
<td>NS</td>
</tr>
<tr>
<td>Wolf,J.M. 2009</td>
<td>Low</td>
<td>N= ; all were in military</td>
<td>method of diagnosis not explained and done by multiple physicians and specialists</td>
<td>rank junior enlisted vs junior officer</td>
<td>age, Gender/Sex, and race/ethnicity</td>
<td>Poisson regression rate ratio</td>
<td>1.53 (1.47, 1.59)</td>
<td>junior enlisted soldiers had a significantly higher rate of CTS than junior officers</td>
</tr>
<tr>
<td>Wolf,J.M. 2009</td>
<td>Low</td>
<td>N= ; all were in military</td>
<td>method of diagnosis not explained and done by multiple physicians and specialists</td>
<td>rank senior enlisted vs junior officer</td>
<td>age, Gender/Sex, and race/ethnicity</td>
<td>Poisson regression rate ratio</td>
<td>3.18 (3.06, 3.30)</td>
<td>senior enlisted soldiers had a significantly higher rate of CTS than junior officers</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
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<td>CTS Diagnostics</td>
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<tr>
<td>Wolf,J.M. 2009</td>
<td>Low</td>
<td>N= ; all were in military</td>
<td>method of diagnosis not explained and done by multiple physicians and specialists</td>
<td>rank senior officer vs junior officer</td>
<td>age, Gender/Sex, and race/ethnicity</td>
<td>Poisson regression rate ratio</td>
<td>2.72 (2.60, 2.85)</td>
<td>senior officer soldiers had a significantly higher rate of CTS than junior officers</td>
</tr>
<tr>
<td>Cartwright,M.S. 2012</td>
<td>Moderate</td>
<td>N= 287 ; Latino manual labor workers in 4 North Carolina counties</td>
<td>diagnosed with a combination of symptoms reported through Katz hand diagram, and nerve conduction studies</td>
<td>poultry worker vs not a poultry worker</td>
<td>age, BMI, Gender/Sex, accounting for center and within person wrist correlation</td>
<td>logistic regression</td>
<td>2.51(1.8, 3.5)</td>
<td>odds higher in poultry workers</td>
</tr>
<tr>
<td>Cartwright,M.S. 2014</td>
<td>Moderate</td>
<td>N= 173 ; Latino poultry and non-poultry manual workers</td>
<td>diagnosed with a combination of symptoms reported through Katz hand diagram, and nerve conduction studies at 1 year</td>
<td>poultry worker vs not a poultry worker</td>
<td>age, BMI, Gender/Sex, accounting for center and within person wrist correlation</td>
<td>logistic regression odds ratio</td>
<td>1.81(.83, 3.98)</td>
<td>NS</td>
</tr>
<tr>
<td>Roquelaure,Y. 2008</td>
<td>Moderate</td>
<td>N= 193802 ; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Craftswomen, saleswomen, and managers vs unemployed</td>
<td>matched by: among men ; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>0.8 [0.4-1.6]</td>
<td>NS</td>
</tr>
<tr>
<td>Roquelaure,Y. 2008</td>
<td>Moderate</td>
<td>N= 194276 ; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Craftswomen, saleswomen, and managers vs unemployed</td>
<td>matched by: among women ; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>0.5 [0.3-1.2]</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<tr>
<td>Akbar, M., 2014</td>
<td>Low</td>
<td>N= 112 ; paraplegic recruited from hospital database, and controls recruited through advertisements in the community</td>
<td>history, phalen and Tinel</td>
<td>paraplegic vs healthy controls</td>
<td>matched by: age, Gender/Sex ; covariates: paraplegic vs not</td>
<td>odds ratio</td>
<td>21.67 (6.85, 68.56)</td>
<td>odds higher in paraplegics</td>
</tr>
<tr>
<td>Akbar, M., 2014</td>
<td>Low</td>
<td>N= 112 ; paraplegic recruited from hospital database, and controls recruited through advertisements in the community</td>
<td>electrodiagnostic</td>
<td>paraplegic vs healthy controls</td>
<td>matched by: age, Gender/Sex ; covariates: paraplegic vs not</td>
<td>odds ratio</td>
<td>7.14 (3.07, 16.62)</td>
<td>odds higher in paraplegics</td>
</tr>
</tbody>
</table>
TABLE 85 RISK FACTOR: PIECEWORK PAYMENT

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
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<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Petit,A. 2015</td>
<td>Moderate</td>
<td>French salaried workers working in manufacturing industry and services sector as skilled and unskilled blue collar workers</td>
<td>CTS symptoms on the day of medical exam (or for at least 4 days during the preceding 7 days)</td>
<td>payment on a piecework basis</td>
<td>Gender/Sex, age, use of vibrating hand tools, exposure to cold temperature, holding objects in pinch grip, extreme wrist bending posture, pressing with palm base, force, and work organization factors</td>
<td>Logistical Regression OR</td>
<td>2 (1.1-3.5)</td>
<td>payment on a piecework basis rather than according to working hours increases odds of CTS</td>
</tr>
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<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
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<tr>
<td>Armstrong, T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>using fingers/thumbs as pressing tool</td>
<td>model 1: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, using vibrating tools, assembly line work, twisting forearm work, bending wrist work, using forceful hand grip, using fingers/thumb as pressing tool, using fingers in a pinch grip</td>
<td>logistic regression OR</td>
<td>1.19 (0.80, 1.76)</td>
<td>NS</td>
</tr>
<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>peak exposure to Thumb pressing</td>
<td>age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>1.12 (0.54, 2.35)</td>
<td>NS</td>
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<td>Study</td>
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<td>Population</td>
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<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Thumb pressing in most recent job age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>1.71 (0.76, 3.86)</td>
<td>NS</td>
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<td>Study</td>
<td>Quality</td>
<td>Population</td>
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<tr>
<td>Forst,L. 2006</td>
<td>Low</td>
<td>N= 371; physician and non physician members of North American Spine Society (NASS)</td>
<td>Varied. Based on modified version of questionnaire, and self-diagnosis by physicians</td>
<td>practicing professionally for greater or equal to 5 years&lt;br&gt;age, ethnicity, surgical specialty, obesity (body mass index [BMI] ≥ 30), working as a surgeon for 5 years, use of the Kerrison rongeur (an instrument used for bone removal)</td>
<td>logistic regression odds ratio&lt;br&gt;surgeons with greater than or equal to 5 years experience had significantly greater odds of CTS than those with less experience</td>
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<tr>
<td>Forst,L. 2006</td>
<td>Low</td>
<td>N= 371; physician and non-physician members of North American Spine Society (NASS)</td>
<td>Varied. Based on modified version of questionnaire, and self-diagnosis by physicians</td>
<td>being a surgeon who uses the Kerrison rongeur tool versus not using the tool&lt;br&gt;age, ethnicity, surgical specialty, obesity (body mass index [BMI] ≥ 30), working as a surgeon for 5 years, use of the Kerrison rongeur (an instrument used for bone removal)</td>
<td>logistic regression odds ratio&lt;br&gt;surgeons who used the Kerrison rongeur tool had significantly higher odds of CTS</td>
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<tr>
<td>Jenkins,P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland&lt;br&gt;symptoms and phalen and tinel's sign at 66 months</td>
<td>Professional occupations vs. Associate professional and technical occupations</td>
<td>matched by: all males; covariates: Professional occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios&lt;br&gt;odds are higher than in associate professional and technical occupations</td>
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<tr>
<td>Jenkins,P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland&lt;br&gt;symptoms and phalen and tinel's sign at 66 months</td>
<td>Professional occupations vs. Associate professional and technical occupations</td>
<td>matched by: all females; covariates: Professional occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios&lt;br&gt;odds are higher than in associate professional and technical occupations</td>
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<td>Study</td>
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<tr>
<td>Roquelaure, Y. 2008</td>
<td>Moderate</td>
<td>N= 194276; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Professionals vs unemployed</td>
<td>matched by: among women; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>0.9 [0.6-1.4]</td>
<td>NS</td>
</tr>
<tr>
<td>Roquelaure, Y. 2008</td>
<td>Moderate</td>
<td>N= 193802; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Professionals vs unemployed</td>
<td>matched by: among men; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>0.6 [0.4-1.0]</td>
<td>NS</td>
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### TABLE 88 RISK FACTOR: RACE/ETHNICITY (WHITE VS NON-WHITE)

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<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Race/Ethnicity Black versus White</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression OR</td>
<td>1.2 (0.7-2)</td>
<td>NS</td>
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<tr>
<td>Nathan, P.A. 2002</td>
<td>Moderate</td>
<td>N= 256; workers at 4 industrial sites (a steel mill, meat/food packaging, electronics, and plastics).</td>
<td>electrodiagnostic test and symptoms at 11 years</td>
<td>Race/Ethnicity White vs nonwhite</td>
<td>repetitious movement, heavy lifting, keyboard use, vibration tools, force, cigarette use, Gender/Sex, age, BMI, avocational activities, hormone use, race/ethnicity, endocrine condition, years on job</td>
<td>logistic regression odds ratio</td>
<td>1.11 (0.25-4.89)</td>
<td>NS</td>
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</table>
### TABLE 89 RISK FACTOR: RAYNAUD’S

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<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td>Winn,F.J.,Jr., 1989</td>
<td>Low</td>
<td>N= 58 ; cases were seen at Baltimore neurology clinic, healthy controls were selected by those who responded to advertisements in the same area</td>
<td>median nerve or motor sensory symptoms</td>
<td>Raynaud’s Symptoms</td>
<td>matched by: age and gender/sex ; covariates: Raynaud’s symptoms and median nerve motor function</td>
<td>logistic regression odds ratio</td>
<td>20.19(4.1,99.33)</td>
<td>Raynaud’s Symptoms result in higher CTS diagnosis odds</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; follow worker populations: carpenters, workers, engineers,</td>
<td>factor analysis</td>
<td>repetition (O*NET subscales: time spent making repetitive motions and time</td>
<td>Model 3 with O*NET factor variables: age, Gender/Sex, body mass index, wrist index, history of diabetes, and</td>
<td>logistic regression OR</td>
<td>1.79 (1.01-3.18)</td>
<td>Work with</td>
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<tr>
<td></td>
<td></td>
<td>laboratory workers, computer workers, and hospital support staff.</td>
<td></td>
<td>spent handling objects) 4th quartile vs 1st</td>
<td>history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work,</td>
<td></td>
<td></td>
<td>high hand</td>
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<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; follow worker populations: carpenters, workers, engineers,</td>
<td>factor analysis</td>
<td>repetition (O*NET subscales: time spent making repetitive motions and time</td>
<td>Model 3 with O*NET factor variables: age, Gender/Sex, body mass index, wrist index, history of diabetes, and</td>
<td>logistic regression OR</td>
<td>1.11 (0.61-2)</td>
<td>NS</td>
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<tr>
<td></td>
<td></td>
<td>laboratory workers, computer workers, and hospital support staff.</td>
<td></td>
<td>spent handling objects) 3rd quartile vs 1st</td>
<td>history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work,</td>
<td></td>
<td></td>
<td>NS</td>
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<tr>
<td>Armstrong,T. 2008</td>
<td>High</td>
<td>N= 1071; follow worker populations: carpenters, workers, engineers,</td>
<td>factor analysis</td>
<td>repetition (O*NET subscales: time spent making repetitive motions and time</td>
<td>Model 3 with O*NET factor variables: age, Gender/Sex, body mass index, wrist index, history of diabetes, and</td>
<td>logistic regression OR</td>
<td>1.48 (0.8-2.74)</td>
<td>NS</td>
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<tr>
<td></td>
<td></td>
<td>laboratory workers, computer workers, and hospital support staff.</td>
<td></td>
<td>spent handling objects) 2nd quartile vs 1st</td>
<td>history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work,</td>
<td></td>
<td></td>
<td>NS</td>
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<tr>
<td>Study</td>
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<tr>
<td>Evanoff, B. 2014</td>
<td>High</td>
<td>711 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Repetitive Motion required adjusted for age, Gender/Sex, and BMI; past diagnosis of CTS or other upper extremity peripheral neuropathy, had a pacemaker or internal defibrillator, or were pregnant at the time of enrollment excluded</td>
<td>Multivariable mixed logistic regression models OR</td>
<td>2.48 (1.05-5.86)</td>
<td>Repetitive Motion in Current Job increases odds of CTS</td>
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<tr>
<td>Yagev, Y. 2001</td>
<td>Low</td>
<td>N= 145; all male patients from one electrophysiological lab at one hospital</td>
<td>electrodiagnostically diagnosed</td>
<td>low force-high repetitive motion jobs vs low force-low repetitive jobs</td>
<td>matched by: all males; covariates: job force-repetition level, age, ethnic origin, education, obesity, smoking habits,</td>
<td>logistic regression odds ratio</td>
<td>2.2 (0.5, 9.9)</td>
<td>NS</td>
</tr>
<tr>
<td>Yagev, Y. 2001</td>
<td>Low</td>
<td>N= 120; all female patients from one electrophysiological lab at one hospital</td>
<td>electrodiagnostically diagnosed</td>
<td>low force-high repetitive motion jobs vs low force-low repetitive jobs</td>
<td>matched by: all females; covariates: job force-repetition level, age, ethnic origin, education, obesity, smoking habits,</td>
<td>logistic regression odds ratio</td>
<td>7.4 (1.9, 28)</td>
<td>odds of CTS were significantly greater among females with low force-higher repetitive jobs than those low force low repetitive jobs</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Yagev,Y. 2001</td>
<td>Low</td>
<td>N= 265 ; all patients from one electrophysiological lab at one hospital</td>
<td>electrodiagnostically diagnosed</td>
<td>low force-high repetitive motion jobs vs low force-low repetitive jobs</td>
<td>job force-repetition level, age, ethnic origin, education, obesity, smoking habits,</td>
<td>logistic regression odds ratio</td>
<td>4.72(1.8,12.5)</td>
<td>odds of CTS were significantly greater among people with low force-high repetitive jobs than those low force low repetitive jobs</td>
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<tr>
<td>Yagev,Y. 2001</td>
<td>Low</td>
<td>N= 102 ; all male patients from one electrophysiological lab at one hospital</td>
<td>electrodiagnostically diagnosed</td>
<td>high force-low repetitive motion jobs vs low force-low repetitive jobs</td>
<td>matched by: all males ; covariates: job force-repetition level, age, ethnic origin, education, obesity, smoking habits,</td>
<td>logistic regression odds ratio</td>
<td>2.8(1.1,6.9)</td>
<td>odds of CTS were significantly greater among males with high force-low repetitive jobs than those low force low repetitive jobs</td>
</tr>
<tr>
<td>Yagev,Y. 2001</td>
<td>Low</td>
<td>N= 138 ; all female patients from one electrophysiological lab at one hospital</td>
<td>electrodiagnostically diagnosed</td>
<td>high force-low repetitive motion jobs vs low force-low repetitive jobs</td>
<td>matched by: all females ; covariates: job force-repetition level, age, ethnic origin, education, obesity, smoking habits,</td>
<td>logistic regression odds ratio</td>
<td>7.0(0.8,6.2)</td>
<td>NS</td>
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<tr>
<td>Study</td>
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<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Yagev,Y. 2001</td>
<td>Low</td>
<td>N= 240 ; all patients from one electrophysiological lab at one hospital</td>
<td>electrodiagnostically diagnosed</td>
<td>high force-low repetitive motion jobs vs low force-low repetitive jobs</td>
<td>job force-repetition level, age, ethnic origin, education, obesity, smoking habits,</td>
<td>logistic regression</td>
<td>3.21(1.5,6.9)</td>
<td>odds of CTS were significantly greater among people with high force-low</td>
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<td></td>
<td>odds ratio</td>
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<td>repetitive jobs than those low force low repetitive jobs</td>
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<tr>
<td>Chiang,H.C. 1990</td>
<td>Moderate</td>
<td>N= 269 ; workers at frozen food plants</td>
<td>neurological examinations and electrophysiological tests</td>
<td>job requires repetitive movement (frozen food packers and non-frozen food packers) vs no repetitive movement (office work)</td>
<td>Age, gender/sex, length of employment, exposure to cold(frozen food packers), repetitive movement (frozen and non-frozen food packers), and cold*repetitious movement interaction</td>
<td>logistic regression</td>
<td>1.87 (1.11, 3.16)</td>
<td>repetitious movement is associated with CTS</td>
</tr>
<tr>
<td>Chiang,H.C. 1990</td>
<td>Moderate</td>
<td>N= 269 ; workers at frozen food plants</td>
<td>neurological examinations and electrophysiological tests</td>
<td>combined effect of repetitive movement and working in the cold(interaction term)</td>
<td>, length of employment, exposure to cold(frozen food packers), repetitive movement (frozen and non-frozen food packers), and cold*repetitious movement interaction</td>
<td>logistic regression</td>
<td>1.83 (1.35, 2.48)</td>
<td>exposure to cold increases the effect of repetitious movement on CTS odds</td>
</tr>
<tr>
<td>Study</td>
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<tr>
<td>Coggon, D. 2013</td>
<td>Moderate</td>
<td>N = 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>use of other repeated movements of the wrist/fingers &gt; 4 hours per day</td>
<td>matched by: gender/sex, age; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression OR</td>
<td>1.5 (1.1-1.9)</td>
<td>odds higher in patients with repeated movements &gt; 4 hours per day</td>
</tr>
<tr>
<td>Goodson, J.T. 2014</td>
<td>Moderate</td>
<td>87 CTS and 74 gender/sex-matched general orthopedic patients from an outpatient orthopedic clinic in the Western US.</td>
<td>(1) Electrodiagnostic (EDX) testing results suggestive of abnormal slowing of the median nerve, (2) the presence of clinical symptoms of CTS, and (3) no confounding syndromes/disorders</td>
<td>occupational repetition</td>
<td>excluded confounding conditions; gender/sex, age, BMI, education levels, ethnicity, and EDX testing results</td>
<td>Logistical Regression OR</td>
<td>1.84(1.27,2.67)</td>
<td>occupational repetition increases odds</td>
</tr>
<tr>
<td>Silverstein, B.A. 1987</td>
<td>Moderate</td>
<td>N = 652; workers form seven different industrial sites</td>
<td>based on phalen and tinel's signs and symptoms mentioned in interview</td>
<td>high force-low repetitive motion jobs vs low force-low repetitive jobs</td>
<td>Gender/Sex, age, years on job, work repetition, level of force involved in job, dummy variables controlling for job center effects</td>
<td>logistic regression OR</td>
<td>1.8(0.16,20.59)</td>
<td>NS</td>
</tr>
<tr>
<td>Silverstein, B.A. 1987</td>
<td>Moderate</td>
<td>N = 652; workers form seven different industrial sites</td>
<td>based on phalen and tinel's signs and symptoms mentioned in interview</td>
<td>low force-high repetitive motion jobs vs low force-low repetitive jobs</td>
<td>Gender/Sex, age, years on job, work repetition, level of force involved in job, dummy variables controlling for job center effects</td>
<td>logistic regression OR</td>
<td>2.7(0.26,28.36)</td>
<td>NS</td>
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<tr>
<td>Study</td>
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<td>Silverstein, B.A. 1987</td>
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<td>N= 652; workers form seven different industrial sites</td>
<td>based on phalen and tinel's signs and symptoms mentioned in interview</td>
<td>high force-high repetitive motion jobs vs low force-low repetitive jobs</td>
<td>Gender/Sex, age, years on job, work repetition, level of force involved in job, dummy variables controlling for job center effects</td>
<td>logistic regression OR</td>
<td>15.52(1.7,141.52)</td>
<td>working in a high force-high repetition job was associated with higher odds of CTS than Low force-low repetition jobs</td>
</tr>
</tbody>
</table>


TABLE 91 RISK FACTOR: ROTATION

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong, T. 2008</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>twisting forearm</td>
<td>model 1: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, using vibrating tools, assembly line work, twisting forearm work, bending wrist work, using forceful hand grip, using fingers/thumb as pressing tool, using fingers in a pinch grip</td>
<td>logistic regression OR</td>
<td>1.78 (1.18, 2.69)</td>
<td>twisting forearm is associated with higher odds of median neuropathy</td>
</tr>
<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>peak exposure to Forearm rotation</td>
<td>age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>1.36 (0.66, 2.83)</td>
<td>NS</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
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<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Forearm rotation in most recent job age, BMI, Gender/Sex, medical history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>1.23 (0.51, 2.94)</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Evanoff, B. 2012</td>
<td>Moderate</td>
<td>N = 745; newly employed workers symptoms and NCS at 3 years forearm rotation</td>
<td>age, Gender/Sex, lifting at least 1 kg, forceful grip, finger/thumb pressing, using vibrating tools, pinch grip, forearm rotation, hand/wrist bending</td>
<td>NR</td>
<td>NR</td>
<td>NS</td>
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</tbody>
</table>
**TABLE 92 RISK FACTOR: SF-36 PHYSICAL COMPONENT**

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<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goodson, J.T. 2014</td>
<td>Moderate</td>
<td>87 CTS and 74 gender/sex-matched general orthopedic patients from an outpatient orthopedic clinic in the Western US.</td>
<td>(1)Electrodiagnostic (EDX) testing results suggestive of abnormal slowing of the median nerve, (2) the presence of clinical symptoms of CTS, and (3) no confounding syndromes/disorders</td>
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<td></td>
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<td></td>
<td>Physical component summary scores (subset of SF-36)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>excluded confounding conditions; gender/sex, age, education levels, ethnicity, and EDX testing results</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Logistical Regression</td>
<td>0.94(0.9,0.99)</td>
<td>Better SF-36 scores are associated with decreased odds of CTS</td>
</tr>
</tbody>
</table>
**TABLE 93 RISK FACTOR: SALES**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jenkins, P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Sales and customer service occupations vs. Associate professional and technical occupations</td>
<td>matched by: all males; covariates: Sales and customer service occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>2.26 (1.024–4.83)</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Jenkins, P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Sales and customer service occupations vs. Associate professional and technical occupations</td>
<td>matched by: all females; covariates: Sales and customer service occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>2.17 (1.38–3.48)</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Jenkins,P.J.</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Caring, leisure, and other service occupations vs. Associate professional and technical occupations</td>
<td>matched by: all males; covariates: Caring, leisure, and other service occupations vs. Associate professional and technical occupations</td>
<td>univariate</td>
<td>odds ratios</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Jenkins,P.J.</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Caring, leisure, and other service occupations vs. Associate professional and technical occupations</td>
<td>matched by: all females; covariates: Caring, leisure, and other service occupations vs. Associate professional and technical occupations</td>
<td>univariate</td>
<td>odds ratios</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Bonfiglioli,R.</td>
<td>Moderate</td>
<td>N= 269; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS symptoms</td>
<td>Part-time cashiers vs office worker work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td></td>
<td>1.26(0.59–2.67)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli,R.</td>
<td>Moderate</td>
<td>N= 269; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS symptoms</td>
<td>Full-time cashiers vs office worker work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td></td>
<td>2.74(1.18–6.32)</td>
<td>full time cashiers are at higher odds than office workers</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS diagnosis with clinical and electrodiagnostic examinations</td>
<td>Part-time cashiers vs office worker</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>1.06(0.35–3.21)</td>
<td>NS</td>
</tr>
<tr>
<td>Bonfiglioli,R. 2007</td>
<td>Moderate</td>
<td>N= 269 ; cashiers and office workers from 4 big supermarket stores</td>
<td>CTS diagnosis with clinical and electrodiagnostic examinations</td>
<td>Full-time cashiers vs office worker</td>
<td>work(cashiers vs office workers), BMI, age, previous at risk jobs, CTS family history, presence of children, do hand-knitting/needle work, over 8 years of education,</td>
<td>logistic regression odds ratio</td>
<td>1.81(0.52–6.34)</td>
<td>NS</td>
</tr>
<tr>
<td>Morgenstern,H. 1991</td>
<td>Moderate</td>
<td>N= 1052 ; grocery store checkers belonging to local California union</td>
<td>symptoms of CTS indicated in questionnaire</td>
<td>use of laser scanner to check items</td>
<td>matched by: all members were members of union food and commercial workers union ; covariates: age, hours per work week, years worked, age*years worked interaction, use of laser scanner to check items, unload basket before checking, load and lift grocery bags after checking, currently pregnant, contraceptive use, use of exogenous estrogen, use of diuretics, history of broken wrist</td>
<td>logistic regression odds ratio</td>
<td>0.99(0.65, 1.49)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Morgenstern,H.</td>
<td>Moderate</td>
<td>N= 1054; grocery store checkers belonging to local California union</td>
<td>symptoms of CTS indicated in questionnaire</td>
<td>unload basket before checking</td>
<td>matched by: all members were members of union food and commercial workers union; covariates: age, hours per work week, years worked, age*years worked interaction, use of laser scanner to check items, unload basket before checking, load and lift grocery bags after checking, currently pregnant, contraceptive use, use of exogenous estrogen, use of diuretics, history of broken wrist</td>
<td>logistic regression odds ratio</td>
<td>0.97(0.66, 1.44)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Morgenstern,H. 1991</td>
<td>Moderate</td>
<td>N= 1049; grocery store checkers belonging to local California union</td>
<td>symptoms of CTS indicated in questionnaire</td>
<td>load and lift groceries after checking</td>
<td>matched by: all members were members of union food and commercial workers union; covariates: age, hours per work week, years worked, age*years worked interaction, use of laser scanner to check items, unload basket before checking, load and lift grocery bags after checking, currently pregnant, contraceptive use, use of exogenous estrogen, use of diuretics, history of broken wrist</td>
<td>logistic regression odds ratio</td>
<td>0.94(0.35, 2.57)</td>
<td>NS</td>
</tr>
</tbody>
</table>
**TABLE 95 RISK FACTOR: SKILLED TRADES**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jenkins, P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Skilled trades occupations vs. Associate professional and technical occupations</td>
<td>matched by: all males; covariates: Skilled trades occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>4.19 (2.57–7.18)</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Jenkins, P.J. 2013</td>
<td>Low</td>
<td>N= unclear; prospective audit database of General Registrar Office for Scotland</td>
<td>symptoms and phalen and tinel's sign at 66 months</td>
<td>Skilled trades occupations vs. Associate professional and technical occupations</td>
<td>matched by: all females; covariates: Skilled trades occupations vs. Associate professional and technical occupations</td>
<td>univariate odds ratios</td>
<td>8.26 (4.98–13.86)</td>
<td>odds are higher than in associate professional and technical occupations</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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</tr>
<tr>
<td>Bland, J.D. 2005</td>
<td>Low</td>
<td>N= 4155; all patients referred to the neurophysiology service at hospital for suspicion of CTS</td>
<td>NCS confirmed CTS</td>
<td>Smoking</td>
<td>Gender/sex, smoking, age, BMI*age interaction</td>
<td>logistic regression</td>
<td>OR 1.11 (0.94,1.29)</td>
<td>NS</td>
</tr>
<tr>
<td>Wright, C. 2014</td>
<td>Low</td>
<td>(3155 w/o CTS diagnosis and 91 with CTS diagnosis); EMR of a cohort of pregnant women receiving prenatal care at a large obstetrics unit; representative of those served by the urban academic center, with a large proportion of black patients</td>
<td>clinically diagnosed with ICD 9 diagnosis code for CTS</td>
<td>Non-Smoking versus smoker</td>
<td>age, race/ethnicity, education, smoking, parity, hypertension, diabetes, maternal weight category (constructed variable including information about maternal BMI and GWG), and number prenatal care visits</td>
<td>Logistical Regression</td>
<td>OR 1.32 (0.37-5.85)</td>
<td>NS</td>
</tr>
<tr>
<td>Coggon, D. 2013</td>
<td>Moderate</td>
<td>N= 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>ex-smoker vs non smoker</td>
<td>matched by: gender/sex, age; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression</td>
<td>OR 1.1 (0.8-1.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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</tr>
<tr>
<td>Coggon,D.</td>
<td>Moderate</td>
<td>N= 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>current smoker vs non smoker</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression OR</td>
<td>0.6 (0.4-0.8)</td>
<td>odds lower in smokers than non-smokers</td>
</tr>
<tr>
<td>Coggon,D.</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>ex-smoker vs non smoker</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression OR</td>
<td>1.2 (0.9-1.7)</td>
<td>NS</td>
</tr>
<tr>
<td>Coggon,D.</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>current smoker vs non smoker</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression OR</td>
<td>0.8 (0.5-1.1)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Eleftheriou,A. 2012</td>
<td>Moderate</td>
<td>N= 441 ; 548 workers of a Governmental data entry &amp; processing unit</td>
<td>personal history of CTS</td>
<td>ever smoked(yes vs no)</td>
<td>Keyboard strokes, age, physical activity, smoking</td>
<td>logistic regression OR</td>
<td>1.99 (1.01 to 3.54)</td>
<td>having ever smoked is associated with CTS</td>
</tr>
<tr>
<td>Geoghegan,J.M. 2004</td>
<td>Moderate</td>
<td>N= 3350 ; patients from the UK General Practice Research Database</td>
<td>diagnosed CTS</td>
<td>Smoker</td>
<td>matched by: age, gender/sex, and general practice ; covariates: consulting rate, BMI, smoking, diabetes, insulin use, metformin use, sulphonyl use, hormone replacement therapy, corticosteroid use, combined oral contraceptive pill use, Thyroxine use, Rheumatoid arthritis, wrist fracture, arthritis, also adjusted for missing data on smoking and BMI</td>
<td>logistic regression OR</td>
<td>1.03 (0.93–1.13)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
<td>Results</td>
<td>Significance</td>
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<tr>
<td>Violante,F.S. 2007</td>
<td>Moderate</td>
<td>Blue-collar workers of several factories (producing large and small domestic appliances, underwear, ceramic tiles, and shoes and workers employed in all municipal nursery schools.</td>
<td>occurrence within last month of “classic/ probable” or “possible” symptoms of CTS</td>
<td>Smoking (ever smoked versus not)</td>
<td>gender/sex, age, biomechanical load, BMI<em>wrist interaction effect, height</em>forearm interaction effect, family history of CTS, pathologies facilitating CTS onset(diabetes mellitus, amyloidosis, gout, progressive systemic sclerosis, rheumatoid arthritis, systemic lupus erythematosus, thyroid disorders, tendonitis of the finger flexors, and chronic renal failure) alcohol consumption, smoking status, previous exposure to biomechanical overload</td>
<td>Logistic Regression</td>
<td>OR 1.7(1.2-1.4)</td>
<td>having ever smoked increases odds of CTS</td>
</tr>
</tbody>
</table>
**TABLE 97 RISK FACTOR: STATIC STRENGTH**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evanoff, B. 2014</td>
<td>High</td>
<td>711 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Static strength importance in current job</td>
<td>adjusted for age, Gender/Sex, and BMI; past diagnosis of CTS or other upper extremity peripheral neuropathy, had a pacemaker or internal defibrillator, or were pregnant at the time of enrollment excluded</td>
<td>Multivariable mixed logistic regression models OR</td>
<td>2.7 (0.85 - 8.55)</td>
<td>NS</td>
</tr>
</tbody>
</table>
### TABLE 98 RISK FACTOR: STRAIN

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garg, A. 2012</td>
<td>High</td>
<td>N = 536; workers from a wide range of manufacturing facilities in the Midwest</td>
<td>symptoms (tingling and/or numbness) in at least 2 median nerve served digits, symptoms at least 25% of days in previous month, symptoms for at least 2 or more consecutive monthly follow ups, abnormal NCS at 6 years</td>
<td>Strain index above 6.1 vs less than or equal to 6.1</td>
<td>Model 2: strain index, age, BMI (continuous), number of other distal upper extremity musculoskeletal disorders, gardening, feeling down, blue or depressed, rheumatoid arthritis</td>
<td>cox proportional hazard ratio</td>
<td>2.5 (1.00–6.13)</td>
<td>having high job strain is associated with higher risk of CTS</td>
</tr>
<tr>
<td>Burt, S. 2013</td>
<td>Moderate</td>
<td>N = 347; workers from hospital, school bus manufacturing plant, and engine assembly plant</td>
<td>electrodiagnostic test, symptoms, hand diagram at 2 years</td>
<td>Job Strain(Job Content Questionnaire)</td>
<td>model 2: threshold limit value, BMI, Job strain</td>
<td>hazard ratios</td>
<td>2.13 (1.001, 4.54)</td>
<td>having high job strain is associated with higher risk of CTS</td>
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</table>
### TABLE 99 RISK FACTOR: SYMPTOMS

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gell,N. 2005</td>
<td>Low</td>
<td>N= 414 ; workers from 4 industrial and 3 clerical work sites</td>
<td>numbness, tingling, burning, or pain in the distribution of the median nerve (based on a hand diagram score of “probable” or “definite”) with ipsilateral median nerve conduction slowing at average 5.4 years</td>
<td>median ulnar peak latency difference</td>
<td>BMI &gt; 27, median ulnar peak latency difference, numbness tingling, burning, pain in the hand at baseline</td>
<td>logistic</td>
<td>1.29(1.2,1.4)</td>
<td>for each one unit increase in median ulnar peak latency difference, CTS odds are increase by a factor of 1.29</td>
</tr>
<tr>
<td>Vogelsang,L.M.</td>
<td>Low</td>
<td>N= 100 ; all were worked in what were considered high risk occupations(automotive parts or assembly workers, keyboard operators, electronics industry workers, and garment industry workers from East Tennessee, and sign language interpreters). Each case was matched by age, Gender/Sex, race/ethnicity, height, weight, body type, length of time, job duties</td>
<td>diagnosed by orthopaedist</td>
<td>CHIPS, Cohen-Hoberman Inventory of Physical Symptoms</td>
<td>social readjustment scale, self-control schedule, life style approaches scale, self-control questionnaire, perceived stress scales, Cohen-Hoberman Inventory of Physical Symptoms, related medical condition, suspected medical risk, related musculoskeletal problems</td>
<td>p value log</td>
<td>&lt;.05</td>
<td>higher scores on the physical symptoms inventory increased the odds of CTS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Werner,R.A. 2005</td>
<td>Low</td>
<td>N= 189; all were automobile assembly line workers</td>
<td>hand diagram symptoms, and median sensory evoked response that .5 msec longer than ipsilateral ulnar sensory response at 1 year</td>
<td>Median–ulnar peak latency at least 0.8 msec</td>
<td>Gender/Sex, wrist/hand tendonitis, diabetes, coworker support, median ulnar peak latency on dominant side, elbow posture rating</td>
<td>logistic regression odds ratio</td>
<td>7.75(1.3, 45.84)</td>
<td>having a median–ulnar peak latency at least 0.8 msec significantly increased the odds of CTS</td>
</tr>
<tr>
<td>Winn,F.J.,Jr., 1989</td>
<td>Low</td>
<td>N= 58; cases were seen at Baltimore neurology clinic, healthy controls were selected by those who responded to advertisements in the same area</td>
<td>median nerve or motor sensory symptoms</td>
<td>matched by: age and gender/sex; covariates: Raynaud’s symptoms and median nerve motor function</td>
<td>logistic regression odds ratio</td>
<td>0.31(0.13,0.73)</td>
<td>better median nerve motor function is associated with decreased CTS odds</td>
<td></td>
</tr>
<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>I moderately distressing somatic symptom vs no distressing somatic symptoms in past week</td>
<td>matched by: gender/sex, age; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression OR</td>
<td>0.7 (0.4-1.0)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>Coggon,D. 2013</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>2 or more moderately distressing somatic symptom vs no distressing somatic symptoms in past week</td>
<td>matched by: gender/sex, age; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression OR</td>
<td>0.6 (0.4-0.9)</td>
<td>positive tested patients were less likely to have 2 or more moderately distressing somatic symptoms than negative tested patients</td>
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</table>
### TABLE 100 RISK FACTOR: TECHNICAL JOBS

<table>
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<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td>Roquelaure, Y. 2008</td>
<td>Moderate</td>
<td>N= 194276 ; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Technicians associate professionals vs unemployed</td>
<td>matched by: among women ; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>0.6 [0.5-0.8]</td>
<td>risk significantly lower than in the unemployed</td>
</tr>
<tr>
<td>Roquelaure, Y. 2008</td>
<td>Moderate</td>
<td>N= 193802 ; French prospectively CTS surveillance system</td>
<td>clinical and electrodiagnostic tests at 3 years</td>
<td>Technicians associate professionals vs unemployed</td>
<td>matched by: among men ; covariates: controlled for age, stratified by gender/sex</td>
<td>relative risk ratio</td>
<td>0.6 [0.4-0.8]</td>
<td>risk significantly lower than in the unemployed</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
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<td>Significance</td>
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<tr>
<td>Armstrong,T.</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>shoulder tendonitis history</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>2.66 (0.97, 7.29)</td>
<td>NS</td>
</tr>
<tr>
<td>Armstrong,T.</td>
<td>High</td>
<td>N= 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>shoulder tendonitis history</td>
<td>Model 3 with O*NET factor variables: age, gender, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>2.95 (1.09, 7.95)</td>
<td>History of shoulder tendonitis increases odds of CTS</td>
</tr>
<tr>
<td>Werner,R.A.</td>
<td>Low</td>
<td>N= 189 ; all were automobile assembly line workers</td>
<td>hand diagram symptoms, and median sensory evoked response that .5 msec longer than ipsilateral ulnar sensory response at 1 year</td>
<td>Wrist/hand/finger tendonitis at baseline</td>
<td>Gender/Sex, wrist/hand tendonitis, diabetes, coworker support, median ulnar peak latency on dominant side, elbow posture rating</td>
<td>logistic regression odds ratio</td>
<td>4.74(1.09– 20.43)</td>
<td>Wrist/hand/finger tendonitis significantly increased the odds of CTS</td>
</tr>
</tbody>
</table>
### TABLE 102 RISK FACTOR: VARICOSIS

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
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</thead>
<tbody>
<tr>
<td>de Krom, M.C. 1990</td>
<td>Moderate</td>
<td>N= 629; 28 cases and all controls were identified through random sample of patients in the Netherlands. An additional 128 cases were added from a single hospital in the area</td>
<td>clinical history and neurophysiologic testing</td>
<td>varicosis</td>
<td>matched by: age and gender/sex stratified random sample ; covariates: height, weight(kg), slimming courses(yes/no), Hours/week in flexion activities, hours/week for extension activities, Varicosis (for men only), for women: years since menopause onset vs pre-menopausal, hysterectomy vs premenopausal</td>
<td>logistic regression odds ratio</td>
<td>9.78(2.73, 34.95)</td>
<td>varicosis is significantly associated with increased odds of CTS in males</td>
</tr>
</tbody>
</table>
### TABLE 103 RISK FACTOR: VIBRATION

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
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<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armstrong, T. 2008</td>
<td>High</td>
<td>N = 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>using vibrating hand tools</td>
<td>model 1: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, using vibrating tools, assembly line work, twisting forearm work, bending wrist work, using forceful hand grip, using fingers/thumb as pressing tool, using fingers in a pinch grip</td>
<td>logistic regression OR</td>
<td>1.88 (1.23, 2.85)</td>
<td>using vibrating hand tools is associated with higher odds of median neuropathy</td>
</tr>
<tr>
<td>Armstrong, T. 2008</td>
<td>High</td>
<td>N = 1071; following worker populations: carpenters, workers, engineers, laboratory workers, computer workers, and hospital support staff.</td>
<td>median neuropathy cases</td>
<td>using vibrating hand tools</td>
<td>model 2 best fitting model: age, Gender/Sex, body mass index, wrist index, history of diabetes, and history of shoulder tendonitis, lifting more than 2lbs/day, assembly line work, hospital vs clerical work, construction vs clerical work</td>
<td>logistic regression OR</td>
<td>1.50 (0.98, 2.31)</td>
<td>NS</td>
</tr>
<tr>
<td>Coggon, D. 2013</td>
<td>Moderate</td>
<td>N = 1230; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs healthy controls</td>
<td>Work for &gt; 1 hour per day with vibrating tools</td>
<td>matched by: gender/sex, age; covariates: ethnicity, BMI, smoking, mental health, repeated movements, vibrating tools, job control, level of supervisor/colleague support</td>
<td>logistic regression OR</td>
<td>2.4 (1.6-3.8)</td>
<td>odds higher in patients using vibrating tools</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Coggon, D. 2013</td>
<td>Moderate</td>
<td>N= 855; cases were selected from the neurophysiology department and controls for the accident and emergency services at Southampton general hospital. All were aged 20-64</td>
<td>neurophysiologically positive patients vs negatively tested patients</td>
<td>work with vibrating tools &gt;1 hours per day</td>
<td>matched by: gender/sex, age ; covariates: ethnicity, BMI, smoking habits, diabetes, other arthritis present, number of moderately distressing somatic symptoms per week, use of keyboard 4 or more hours per day, use of vibrating tools, job includes bonuses/targets/deadlines</td>
<td>logistic regression</td>
<td>OR 1.4 (0.9-2.2)</td>
<td>NS</td>
</tr>
<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>peak exposure to Using vibrating tools</td>
<td>age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistic Regression</td>
<td>OR 2.24 (1.02, 4.92)</td>
<td>increased odds of CTS for those using vibrating tool use at work</td>
</tr>
<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Using vibrating tools in most recent job</td>
<td>age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistic Regression</td>
<td>OR 2.04 (0.82, 5.09)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Nordstrom,D.L., 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Power tool use 0.08-0.75 hours/day vs none</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>0.53 (0.17, 1.64)</td>
<td>NS</td>
</tr>
<tr>
<td>Nordstrom,D.L., 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Power tool use 1-2 hours/day vs none</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>1.43 (0.52, 3.90)</td>
<td>NS</td>
</tr>
<tr>
<td>Nordstrom,D.L., 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Power tool use 2.5-5.5 hours/day vs none</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>1.58 (0.63, 4.00)</td>
<td>NS</td>
</tr>
<tr>
<td>Nordstrom,D.L., 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Power tool use 6-11 hours/day vs none</td>
<td>matched by: age ; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>3.30(1.11, 9.8)</td>
<td>odds higher in workers who use power tools 6-11 hours/day</td>
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</table>
**TABLE 104 RISK FACTOR: WORK LENGTH**

<table>
<thead>
<tr>
<th>Study</th>
<th>Quality</th>
<th>Population</th>
<th>CTS Diagnostics</th>
<th>Risk Factor</th>
<th>Confounding Adjustment</th>
<th>Stat. Type</th>
<th>Results</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matias,A.C. 1998</td>
<td>Moderate</td>
<td>N= 100 ; video display terminal operators at Midwestern university</td>
<td>&quot;medically diagnosed&quot; CTS</td>
<td>work day duration</td>
<td>work day duration</td>
<td>logistic regression odds ratio</td>
<td>1.015 (.0479)</td>
<td>longer work day is associated with increased CTS odds</td>
</tr>
<tr>
<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>current job length 2nd vs 1st quartile</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>0.83 (0.26-2.69)</td>
<td>NS</td>
</tr>
<tr>
<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>current job length 3rd vs 1st quartile</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>0.77 (0.24-2.43)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
<td>Stat. Type</td>
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<tr>
<td>Mondelli,M. 2006</td>
<td>Moderate</td>
<td>N= 145 ; female hospital floor cleaners in Italy</td>
<td>diagnosed according to AAN criteria: population of hospital floor cleaners</td>
<td>current job length 4th vs 1st quartile</td>
<td>Age, BMI, duration of occupational exposure to current job, occupational exposure to the same job for previous employers, manual hobbies (including motorcycle use, diseases known to be associated with CTS (diabetes connective tissue diseases, hypothyroidism, and wrist/hand trauma), hospital (to adjust for center effects)</td>
<td>logistic regression OR</td>
<td>1.75 (0.54-5.65)</td>
<td>NS</td>
</tr>
<tr>
<td>Morgenstern,H. 1991</td>
<td>Moderate</td>
<td>N= 1058 ; grocery store checkers belonging to local California union</td>
<td>symptoms of CTS indicated in questionnaire</td>
<td>hours worked per week</td>
<td>matched by: all members were members of union food and commercial workers union ; covariates: age, hours per work week, years worked, age*years worked interaction, use of laser scanner to check items, unload basket before checking, load and lift grocery bags after checking, currently pregnant, contraceptive use, use of exogenous estrogen, use of diuretics, history of broken wrist</td>
<td>logistic regression odds ratio</td>
<td>1.03(p=.0081)</td>
<td>NS</td>
</tr>
<tr>
<td>Study</td>
<td>Quality</td>
<td>Population</td>
<td>CTS Diagnostics</td>
<td>Risk Factor</td>
<td>Confounding Adjustment</td>
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<tr>
<td>Morgenstern, H. 1991</td>
<td>Moderate</td>
<td>N= 1058 ; grocery store checkers belonging to local California union</td>
<td>symptoms of CTS indicated in questionnaire</td>
<td>years worked</td>
<td>matched by: all members were members of union food and commercial workers union; covariates: age, hours per work week, years worked, age*years worked interaction, use of laser scanner to check items, unload basket before checking, load and lift grocery bags after checking, currently pregnant, contraceptive use, use of exogenous estrogen, use of diuretics, history of broken wrist</td>
<td>logistic regression odds ratio</td>
<td>.1238 (p=.055)</td>
<td>NS</td>
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<td>Nordstrom, D.L. 1997</td>
<td>Moderate</td>
<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>worked 3048-4857 vs 2954 hours</td>
<td>matched by: age; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>1.54 (0.74, 3.20)</td>
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<td>Nordstrom, D.L. 1997</td>
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<td>N= 417 ; only incident cases diagnosed between 1994 and 1995 were eligible as cases in Marshfield Wisconsin, and controls were a random sample from this area</td>
<td>Diagnosed by physician, or had explicit treatment for CTS and hand symptoms within one month of date of diagnosis.</td>
<td>Worked 5464-6507 vs 2954 hours</td>
<td>matched by: age; covariates: musculoskeletal condition, BMI, Parent/sibling/child has CTS, power tool use, hours bending or twisting wrists, hours contacted with solvents per day, IOSH job control measure, cumulative hours worked since 1993</td>
<td>logistic regression OR</td>
<td>0.43 (0.18, 1.05)</td>
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<td>Silverstein, B.A. 1987</td>
<td>Moderate</td>
<td>N= 652; workers form seven different industrial sites</td>
<td>based on phalen and tinel’s signs and symptoms mentioned in interview</td>
<td>years on job</td>
<td>Gender/Sex, age, years on job, work repetition, level of force involved in job, dummy variables controlling for job center effects</td>
<td>logistic regression OR</td>
<td>0.9(0.8,1.02)</td>
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<td>Dale, A.M. 2014</td>
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<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>peak exposure to Finger pinching</td>
<td>age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>0.87 (0.39, 1.93)</td>
<td>NS</td>
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<tr>
<td>Dale, A.M. 2014</td>
<td>Moderate</td>
<td>710 clerical, service, and construction workers from eight participating employers and three construction trade unions between July 2004 and October 2006 into the PrediCTS study</td>
<td>Presence of specific nerve symptoms in survey and median neuropathy by NCS (DML, MUDS, DSL) at 3 years</td>
<td>Finger pinching in most recent job</td>
<td>age, BMI, Gender/Sex, med history, pregnancy, history of CTS or peripheral neuropathy, or other contraindication to receiving nerve conduction studies (NCS), lifting objects, vibrating tools, forearm rotation, wrist bending, forceful gripping, thumb pressing, finger pinching</td>
<td>Logistical Regression OR</td>
<td>0.62 (0.18, 2.08)</td>
<td>NS</td>
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</table>
NONOPERATIVE TREATMENTS FOR CARPAL TUNNEL SYNDROME

A. IMMOBILIZATION
Strong evidence supports that the use of immobilization (brace/splint/orthosis) should improve patient reported outcomes.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.

Rationale
There are two high quality studies (Hall 2013 and Manente 2001) that directly compare the use of brace/splint to no use of brace/splint to treat carpal tunnel syndrome. Hall 2013 compared 8 weeks of full-time splinting versus no splinting. The authors showed statistically significant improvement in pain and function (Boston Questionnaire for assessment of carpal tunnel symptom functional status scale, Boston Questionnaire for assessment of carpal tunnel symptom severity, AS, phalens, grip strength, Purdue Pegboard Test score, Semmes Weinstein monofilaments). The authors describe statistically significant differences when comparing percent change in these factors from pre to post treatment. There were some baseline/pretreatment differences between the groups, such that it calls into question whether these factors were actually statistically different after treatment. Manente 2001 compared four weeks of night bracing to no intervention. The treated group showed a reduction in the Boston Carpal Tunnel Questionnaire symptomatic score (from 2.75 to 1.54 at 4 weeks; p<0.001) and functional score (from 1.89 to 1.48 at 4 weeks; p<0.001). Subjects’ Global Impression of Change Questionnaire documented improvement in the braced group at 4 weeks (p=0.006).

Risks and Harms of Implementing this Recommendation
No harm in implementation of brace/splint use, if tolerated by patient.

B. STEROID INJECTIONS
Strong evidence supports that the use of steroid (methylprednisolone) injection should improve patient reported outcomes.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.

Rationale
There is one high quality study (Atroshi 2013) that directly compares the use of steroid injection to placebo to treat carpal tunnel syndrome. In a prospective, randomized, double-blinded, placebo controlled study, the efficacies of 40mg methylprednisolone and 80mg
methylprednisolone were compared to placebo injection at various time lines (10 weeks and 1 year). At 10 weeks, there was greater improvement in the CTS symptom severity score in the group receiving injections of 40mg or 80mg methylprednisolone (p<0.003) versus placebo injections; but there was no difference amongst the groups at 1 year. However, patients receiving 80mg methylprednisolone injection were less likely to go on to need surgery than placebo injection (p=0.04). A small p-value (p<.05) indicates that this difference was not observed due to chance, subsequently favoring the alternative hypothesis of methylprednisolone injection improving patient outcomes.

Several high quality studies (Dammers 2006[1-3], Wong 2001, and Wong 2005) compare various doses of injected or routes of administration of methylprednisolone to treat carpal tunnel syndrome. In a double blinded, randomized study, Dammers 2006 compare the efficacy of 20, 40, and 60mg methylprednisolone injections to treat carpal tunnel syndrome. There was no significant difference in treatment response at 1 year. In a randomized double blind controlled trial, Wong 2005 compare a the effects of a single 80mg methylprednisolone injection with saline injection at 8 weeks versus two 80mg methylprednisolone injections 8 weeks apart. There was no significant difference between groups respect to Global Symptom Score, electrophysiological study, or functional outcomes (p=0.26). In a prospective randomized double-blind study, Wong 2001 compared 25mg methylprednisolone orally for 10 days and placebo injection to 15mg methylprednisolone injection with oral placebo. The steroid injection provided significant improvement based on Global Symptom Score at 12 weeks.

**Risks and Harms of Implementing this Recommendation**

There is potential harm of corticosteroid injection in the vicinity of flexor tendons and neurovascular structures.

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**C. MAGNET THERAPY**

Strong evidence supports not using magnet therapy for the treatment of carpal tunnel syndrome.

**Strength of Recommendation: Strong Evidence ★★★★★**

Description: Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.

**Rationale**

Several high quality studies (Colbert 2010, Weintraub 2008) evaluated the use of magnets in treating carpal tunnel syndrome. In a prospective randomized double-blinded controlled trial, Weintraub 2008 evaluated the efficacy of a magnet (simultaneous static and time-varying dynamic magnetic field stimulation 4 hours/day for two months). No significant measures of improvement were noted. In a randomized, double-blind controlled trial, Colbert 2010 evaluated the efficacy of magnet (wore nightly for 6 weeks a neodymium magnet of 15 or 45mTesla) versus placebo magnet on the treatment of carpal tunnel syndrome. No significant measures of improvement were noted.

**Risks and Harms of Implementing this Recommendation**

Magnet use may lead to sleep disturbance.
D. ORAL TREATMENTS

Moderate evidence supports no benefit of oral treatments (diuretic, gabapentin, astaxanthin capsules, NSAIDs, or pyridoxine) compared to placebo.

**Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

**Rationale**

Two high quality studies (Chang 1998 and Hui 2011) compare various oral regimens to treat carpal tunnel syndrome. In a prospective randomized double-blind study placebo controlled study, Chang 1993 compare various 4 week oral medication regimens (diuretic [trichlormethiazide 2mg daily] versus NSAID [tenoxicam-SR 20mg daily] versus steroid [2 weeks of prednisolone 20mg daily followed by 2 weeks of 10mg daily]) to placebo. No significant changes from baseline were noted in the placebo, diuretic, or NSAID arms. However, the steroid arm improved significantly at 4 weeks, based on GSS Questionnaire. A review of the data provided indicates that at 4 weeks, the steroid arm had statistically significant improvement over the NSAID and diuretic arms based on GSS Questionnaire. Hui 2011 failed to show any significance when comparing oral Gabapentin to placebo.

**Risks and Harms of Implementing this Recommendation**

There is potential harm of oral NSAID or steroid use.

E. ORAL STEROIDS

Moderate evidence supports that oral steroids could improve patient reported outcomes as compared to placebo.

**Strength of Recommendation: Moderate Evidence ★★★★

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

**Rationale**

Two high quality studies (Chang 1998 and Hui 2011) compare various oral regimens to treat carpal tunnel syndrome. In a prospective randomized double-blind study placebo controlled study, Chang 1993 compare various 4 week oral medication regimens (diuretic [trichlormethiazide 2mg daily] versus NSAID [tenoxicam-SR 20mg daily] versus steroid [2 weeks of prednisolone 20mg daily followed by 2 weeks of 10mg daily]) to placebo. No significant changes from baseline were noted in the placebo, diuretic, or NSAID arms. However, the steroid arm improved significantly at 4 weeks, based on GSS Questionnaire. A review of the data provided indicates that at 4 weeks, the steroid arm had statistically significant improvement over the NSAID and diuretic arms based on GSS Questionnaire. Hui 2011 failed to show any significance when comparing oral Gabapentin to placebo.

**Risks and Harms of Implementing this Recommendation**
There is potential harm of oral NSAID or steroid use.

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**F. KETOPROFEN PHONOPHORESIS**
Moderate evidence supports that ketoprofen phonophoresis could provide reduction in pain compared to placebo.

**Strength of Recommendation: Moderate Evidence**

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

**Rationale**
In a randomized controlled trial, Soyupek 2012 compared phonophoresis with corticosteroid versus phonophoresis with nonsteroidal anti-inflammatory drug use. Phonophoresis with corticosteroid showed statistically significant improved in VAS score. In a prospective, randomized, double-blinded controlled trial, Yildiz 2011 compared the efficacy of 2 weeks of treatment with placebo ultrasound, ultrasound, or ketoprofen phonophoresis. The group that underwent ketoprofen phonophoresis for two weeks demonstrated significant improvement in VAS score over the sham ultrasound and the ultrasound group at two weeks and eight weeks.

**Risks and Harms of Implementing this Recommendation**
No known harm in use of phonophoresis.

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**G. THERAPEUTIC ULTRASOUND**
Limited evidence supports that therapeutic ultrasound might be effective compared to placebo.

**Strength of Recommendation: Limited Evidence**

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

**Rationale**
One high quality study (Ebenbichler 1998) evaluated the use of ultrasound in treating carpal tunnel syndrome. In a randomized controlled trial, Ebenbichler 1998 evaluated the efficacy of ultrasound (20 sessions of 15 minute interventions of 1MHz, 1.0 W/cm, pulse mode 1:4 at 5 sessions/week for 2 weeks followed by 2 sessions/week) versus placebo ultrasound on the treatment of carpal tunnel syndrome. Multiple measures showed significant improvement in the ultrasound group: grip strength, motor distal latency (p<0.001), and pinch strength.

**Risks and Harms of Implementing this Recommendation**
No known harm in use of ultrasound.
H. LASER THERAPY
Limited evidence supports that laser therapy might be effective compared to placebo.

Strength of Recommendation: Limited Evidence 🟢🟢🟢

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

Rationale
Several high quality studies (Chang 2008, Evcik 2007, Fusakul 2014) evaluated the use of laser therapy in treating carpal tunnel syndrome. In a randomized, controlled trial, Chang 2008 evaluated the efficacy of a laser (830nm diode with 10Hz, 50% duty cycle, 60 mW, 9.7J/cm) versus placebo laser on the treatment of carpal tunnel syndrome. The treatment was rendered for 10 minutes daily for 5 days a week for two weeks. After 4 weeks, the laser treatment provided significantly improved grip strengths, digital prehension, and lateral prehension (p<0.05). In a randomized controlled trial, Evcik 2007 evaluated the efficacy of laser (7J/2min) versus placebo laser. The treatment was rendered five times per week for two weeks. After four weeks, significant improvement in grip strength and pinch strength was noted (p<0.001); there was also significant improvement in sensory nerve velocity, sensory distal latency, and motor distal latency (p<0.001). In a randomized double-blinded controlled trial, Fusakul 2014 evaluated the efficacy of laser (gallium-aluminum-arsenide at a dose of 18J/session) versus placebo laser. Grip strength and pinch strength was significantly improved. At 12 weeks follow up, distal motor latency was significantly improved (p<0.05).

Risks and Harms of Implementing this Recommendation
Potential harm of laser therapy is unknown.

Future Research for Nonoperative Treatments
Further research in acupuncture is warranted. In a prospective randomized double-blind controlled study, Yao et al evaluated the efficacy of acupuncture (weekly sessions for 6 weeks) versus placebo to treat carpal tunnel syndrome. No significant measures of improvement were noted. Soft tissue manipulation: further research in manipulation is warranted. Many different techniques are utilized and the terminology distinguishing them is loosely utilized. Further research into linseed oil’s biological mechanism of action, along with technical refinements and specifics in its manufacture are warranted.
## STUDY QUALITY TABLE OF CONSERVATIVE TREATMENTS

**Table 106. Intervention Quality Evaluations**

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
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RESULTS

SUMMARY OF DATA FINDINGS

TABLE 107: SUMMARY OF FINDINGS PICO 6 PART 1 IMMOBILIZATION (EARLY FOLLOW-UP (<90DAYS))

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TABLE 108: SUMMARY OF FINDINGS PICO 6 PART 2 STEROID INJECTION (EARLY FOLLOW-UP (<90DAYS))

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<td>Two-point discrimination</td>
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| Other                          |                        |                        |                        |                  |                  |
| Questionnaire (General/Undefined) |                      |                        |                        |                  |                  |
| SF-6D score                   |                        |                        |                        |                  |                  |
| 35 days                       |                        |                        |                        |                  |                  |
| 70 days                       |                        |                        |                        |                  |                  |

| Pain                           |                        |                        |                        |                  |                  |
| Questionnaire (General/Undefined) |                      |                        |                        |                  |                  |
| SF-36 bodily pain score        |                        |                        |                        |                  |                  |

| Symptoms                       |                        |                        |                        |                  |                  |
| Questionnaire (General/Undefined) |                      |                        |                        |                  |                  |
| CTS symptom severity score     |                        |                        |                        |                  |                  |
| Questionnaire (DASH-Quick DASH) |                        |                        |                        |                  |                  |
| Questionnaire/Scale (GSS)      |                        |                        |                        |                  |                  |

High Quality Meta-Analysis
### TABLE 109: SUMMARY OF FINDINGS PICO 6 PART 2 STEROID INJECTION (LATE FOLLOW-UP (>90DAYS))

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#### Complications

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#### NCS (DML)

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#### Pinch Strength

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#### Other

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#### Pain

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#### Symptoms

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### TABLE 110: SUMMARY OF FINDINGS PICO 6 PART 4 ORAL TREATMENT (EARLY FOLLOW-UP (<90DAYS))

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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Not questionnaire, incidence of night discomfort</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Not questionnaire, incidence of poor coordination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Not questionnaire, incidence of swelling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Questionnaire (Boston-SSS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Questionnaire/Scale (GSS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>
### TABLE 111: SUMMARY OF FINDINGS PICO 6 PART 5 TOPICAL TREATMENT (EARLY FOLLOW-UP (<90DAYS))

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors treatment 1</td>
<td>Chang, Y.W., 2014</td>
</tr>
<tr>
<td>Favors treatment 2</td>
<td>Soyupek, F., 2012</td>
</tr>
<tr>
<td>Not significant</td>
<td>Yildiz, N., 2011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire (Boston-FSS)</td>
</tr>
<tr>
<td>Questionnaire (General/Undefined)</td>
</tr>
<tr>
<td>CTS Functional Scale, no mention of Boston or Levine</td>
</tr>
<tr>
<td>NCS (CMAP)</td>
</tr>
<tr>
<td>NCS (DML)</td>
</tr>
<tr>
<td>NCS (DSL)</td>
</tr>
<tr>
<td>NCS (NCV)</td>
</tr>
<tr>
<td>NCS (SNAP)</td>
</tr>
<tr>
<td>Phalen's test score</td>
</tr>
<tr>
<td>Pinch Strength</td>
</tr>
<tr>
<td>Questionnaire (Boston-FSS)</td>
</tr>
<tr>
<td>Semmes-Weinstein Monofilaments Test (SW test)</td>
</tr>
<tr>
<td>Tinel's Sign/Test</td>
</tr>
<tr>
<td>Ultrasound (US)</td>
</tr>
</tbody>
</table>

| Pain |
| Questionnaire/Scale (VAS-pain) | NA |

| Symptoms |
| Questionnaire (Boston-SSS) | NA |
### TABLE 112: SUMMARY OF FINDINGS PICO 6 PART 6 OTHER TREATMENTS (EARLY FOLLOW-UP (<90DAYS))

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Favors treatment 1</th>
<th>Favors treatment 2</th>
<th>Not significant</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grip Strength</td>
<td>Kilograms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 days</td>
<td>28 days</td>
<td>49 days</td>
<td>84 days</td>
<td>Bakhtiany, A.H., 2004</td>
</tr>
<tr>
<td>Kilograms (digital prehension) (at 28 days)</td>
<td>Bakhtiany, A.H., 2004</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kilograms (lateral prehension)</td>
<td>Bakhtiany, A.H., 2004</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 days</td>
<td>35 days</td>
<td>49 days</td>
<td>84 days</td>
<td>Bakhtiany, A.H., 2004</td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>NCS</td>
<td>Index SAP amplitude</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor nerve velocity, (m/sn)</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensory peak latency of the median nerve (ms)</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thumb SAP amplitude</td>
<td>NA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCS (CMAP)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>NCS (DML)</td>
<td>Distal motor latency (ms)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>0 days</td>
<td>28 days</td>
<td>30 days</td>
<td>42 days</td>
<td>49 days</td>
</tr>
<tr>
<td>Median motor distal latency</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>NCS (DSL)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>NCS (Motor amplitude (uV))</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>NCS (MCV)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>NCS (SNCV)</td>
<td>Sensory nerve conduction velocity (antidromic)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>0 days</td>
<td>49 days</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Sensory nerve conduction velocity (prolonged antidromic wristpalm)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Sensory nerve velocity, (m/sn)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Pinch Strength</td>
<td>Kilograms</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>0 days</td>
<td>28 days</td>
<td>49 days</td>
<td>84 days</td>
<td>NA</td>
</tr>
<tr>
<td>Units not reported</td>
<td>35 days</td>
<td>49 days</td>
<td>84 days</td>
<td>NA</td>
</tr>
<tr>
<td>Questionnaire (Boston-FSS)</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

**High Quality**

- Green indicates a high-quality study.
- Black indicates a low-quality study.
- NA indicates data not available.
# Cont’d Summary of Findings PICO 6 Part 6 Other Treatments (Early Follow-up (<90Days))

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>High Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pain</strong></td>
<td></td>
</tr>
<tr>
<td>Questionnaire (General/Undefined)</td>
<td></td>
</tr>
<tr>
<td>NPS 10. Neuropathic pain scale (NPS)</td>
<td>Bakhtiary, A.H., 2004</td>
</tr>
<tr>
<td>NPS 8. Neuropathic pain scale (NPS)</td>
<td>Colbert, A.P., 2010 (1)</td>
</tr>
<tr>
<td>NPS NA. Neuropathic pain scale (NPS)</td>
<td>Colbert, A.P., 2010 (2)</td>
</tr>
<tr>
<td>Questionnaire/Scale (VAS-pain)</td>
<td>Colbert, A.P., 2010 (3)</td>
</tr>
<tr>
<td>VAS pain (day): 0-10 scale</td>
<td>Ebenbichler, G.R., 1998</td>
</tr>
<tr>
<td>28 days</td>
<td>Evcik, D., 2007</td>
</tr>
<tr>
<td>84 days</td>
<td>Fusakul, Y., 2014</td>
</tr>
<tr>
<td>VAS pain (night): 0-10 scale</td>
<td>Saeed, F.-U., 2012</td>
</tr>
<tr>
<td>28 days</td>
<td>Weintraub, M.I., 2008</td>
</tr>
<tr>
<td>84 days</td>
<td>Yang, C.P., 2011</td>
</tr>
<tr>
<td>Questionnaire/Scale (VAS-patient satisfaction)</td>
<td>Yildiz, N., 2011 (3)</td>
</tr>
<tr>
<td>Sleep interference</td>
<td></td>
</tr>
<tr>
<td>Symptons</td>
<td></td>
</tr>
<tr>
<td>Questionnaire (General/Undefined)</td>
<td></td>
</tr>
<tr>
<td>Not a questionnaire, worst complaint (cm)</td>
<td>Bakhtiary, A.H., 2004</td>
</tr>
<tr>
<td>0 days</td>
<td>Chang, W.D., 2008</td>
</tr>
<tr>
<td>49 days</td>
<td>Colbert, A.P., 2010 (1)</td>
</tr>
<tr>
<td>No mention of Boston scale, rather merely “symptom severity scale”</td>
<td>Colbert, A.P., 2010 (2)</td>
</tr>
<tr>
<td>Questionnaire (Boston-SSS)</td>
<td>Colbert, A.P., 2010 (3)</td>
</tr>
<tr>
<td>35 days</td>
<td>Ebenbichler, G.R., 1998</td>
</tr>
<tr>
<td>42 days</td>
<td>Evcik, D., 2007</td>
</tr>
<tr>
<td>84 days</td>
<td>Fusakul, Y., 2014</td>
</tr>
<tr>
<td>Questionnaire/Scale (GSS)</td>
<td></td>
</tr>
<tr>
<td>Sensory loss</td>
<td></td>
</tr>
<tr>
<td>0 days</td>
<td></td>
</tr>
<tr>
<td>49 days</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td></td>
</tr>
<tr>
<td>Complications (general)</td>
<td></td>
</tr>
<tr>
<td>Pain or paraesthesia complaints</td>
<td>Bakhtiary, A.H., 2004</td>
</tr>
<tr>
<td>0 days</td>
<td>Chang, W.D., 2008</td>
</tr>
<tr>
<td>49 days</td>
<td>Colbert, A.P., 2010 (1)</td>
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### TABLE 113: SUMMARY OF FINDINGS PICO 6 PART 6 OTHER TREATMENTS (LATE FOLLOW-UP (>90DAYS))

<table>
<thead>
<tr>
<th>Favors treatment 1</th>
<th>Favors treatment 2</th>
<th>Not significant</th>
<th>Outcomes</th>
<th>Complications</th>
<th>Function</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

#### Complications
- Complications (general)
  - Pain or paraesthesia complaints

#### Function
- Grip strength (kilograms)
- NCS (CMAP)
- NCS (DML)
- NCS (DSL)
- NCS (MCV)
- NCS (SNAP)
- NCS (SNCV)
- Pinch Strength (kilograms)
- Questionnaire (Boston-FSS)

#### Symptoms
- Questionnaire (General/Undefined)
  - Not questionnaire, worst complaint (cm)
- Questionnaire (Boston-SSS)
- Questionnaire/Scale (GSS)
- Sensory loss

#### Notes
- High Quality
- Meta-Analysis
- NA

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## DETAILED DATA FINDINGS

### TABLE 114: PICO 6 PART 1- IMMOBILIZATION: FUNCTION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>25.01 (9.37)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>23.9 (8.88)</td>
<td>Mean Difference</td>
<td>1.11 (-3.78, 5.995145)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>2.04 (0.74)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>2.08 (0.70)</td>
<td>Mean Difference</td>
<td>-0.04 (-0.43, 0.345427)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) (swm score, palmar side)</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>89.78 (78.98)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>99.68 (87.96)</td>
<td>Mean Difference</td>
<td>-9.9 (-55.04, 35.23541)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>Mean change = 1.07 (p value = 0.018)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>Mean change = 1.85 (p value = 0.107)</td>
<td>Difference between Mean Changes</td>
<td>0.78 (p value = 0.02)</td>
<td>Splint (Splint) (P-value &gt;.05)</td>
</tr>
<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>Mean change = -0.20 (p value = 0.013)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>Mean change = 0.08 (p value = 0.413)</td>
<td>Difference between Mean Changes</td>
<td>0.28 (p value = 0.015)</td>
<td>Splint (Splint) (P-value &gt;.05)</td>
</tr>
<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) (swm score, palmar side)</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>Mean change = -11.13 (p value = 0.073)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>Mean change = -9.63 (p value = 0.313)</td>
<td>Difference between Mean Changes</td>
<td>1.52 (p value &lt;0.001)</td>
<td>Splint (Splint) (P-value &gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>----------------</td>
<td>--------</td>
<td>-----------------</td>
<td>----------</td>
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<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Madjdinasab, N., 2008</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (ms))</td>
<td>1.4 months</td>
<td>Splint (Splint-splint for six weeks)</td>
<td>21</td>
<td>5.21(1.17)</td>
<td>Steroid (Steroid (no splint)-daily for two weeks)</td>
<td>22</td>
<td>4.92(0.91)</td>
<td>Mean Difference</td>
<td>0.29(-0.34,0.918505)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Madjdinasab, N., 2008</td>
<td>High Quality</td>
<td>NCS (DSL) (Distal sensory latency (ms))</td>
<td>1.4 months</td>
<td>Splint (Splint-splint for six weeks)</td>
<td>21</td>
<td>3.51(0.78)</td>
<td>Steroid (Steroid (no splint)-daily for two weeks)</td>
<td>22</td>
<td>3.31(0.45)</td>
<td>Mean Difference</td>
<td>0.2(-0.18,0.582957)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Madjdinasab, N., 2008</td>
<td>High Quality</td>
<td>NCS (MCV) (Motor nerve conduction velocity (ms))</td>
<td>1.4 months</td>
<td>Splint (Splint-splint for six weeks)</td>
<td>21</td>
<td>52.04(4.46)</td>
<td>Steroid (Steroid (no splint)-daily for two weeks)</td>
<td>22</td>
<td>49.97(4.95)</td>
<td>Mean Difference</td>
<td>2.07(-0.74,4.883790)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Manente, G., 2001</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (ms))</td>
<td>1 month</td>
<td>Brace (Immobilization-brace)</td>
<td>40</td>
<td>4.45(1.30)</td>
<td>No brace (Non-immobilization-no brace)</td>
<td>.</td>
<td>4.47(0.80)</td>
<td>Mean Difference</td>
<td>-0.02(-0.49,0.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Manente, G., 2001</td>
<td>High Quality</td>
<td>NCS (SNAP) (Sensory nerve action potential (?V))</td>
<td>1 month</td>
<td>Brace (Immobilization-brace)</td>
<td>40</td>
<td>18.74(15.80)</td>
<td>No brace (Non-immobilization-no brace)</td>
<td>40</td>
<td>12.44(9.40)</td>
<td>Mean Difference</td>
<td>6.3(0.60,11.999)</td>
<td>Brace (Immobilization-brace) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Manente, G., 2001</td>
<td>High Quality</td>
<td>NCS (SNCV) (Sensor y conduction velocity)</td>
<td>1 month</td>
<td>Brace (Immobilization-brace)</td>
<td>40</td>
<td>37.2(11.70)</td>
<td>No brace (Non-immobilization-no brace)</td>
<td>40</td>
<td>37.92(11.70)</td>
<td>Mean Difference</td>
<td>-0.72(-5.85,4.4)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------</td>
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<td>-----------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Manente,G., 2001</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale))</td>
<td>1 month</td>
<td>Brace (Immobilization-brace)</td>
<td>40</td>
<td>1.48(0.50)</td>
<td>No brace (Non-immobilization-no brace)</td>
<td>40</td>
<td>2.03(0.70)</td>
<td>Mean Difference</td>
<td>-0.55(-0.82,-0.28)</td>
<td>Brace (Immobilization-brace) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (CMAP)(Compound muscle action potential)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>11.92(3.01)</td>
<td>NSAID with ultrasound (Phonopores is (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>9.97(3.34)</td>
<td>Mean Difference</td>
<td>1.95(0.11,3.78)</td>
<td>Splinting (Splinting) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (CMAP)(Compound muscle action potential)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>11.92(3.01)</td>
<td>Steroid with ultrasound (Phonopores is (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>10.36(2.57)</td>
<td>Mean Difference</td>
<td>1.56(0.00,3.11)</td>
<td>Splinting (Splinting) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>4.28(0.80)</td>
<td>Steroid with ultrasound (Phonopores is (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>4.39(0.87)</td>
<td>Mean Difference</td>
<td>-0.11(-0.57,0.349067)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>4.28(0.80)</td>
<td>NSAID with ultrasound (Phonophores is ultrasound with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>4.5(1.15)</td>
<td>Mean Difference</td>
<td>-0.22(-0.79,0.352528)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>3.47(1.00)</td>
<td>Steroid with ultrasound (Phonophores is ultrasound with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>3.08(0.96)</td>
<td>Mean Difference</td>
<td>0.39(-0.15,0.931728)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>3.47(1.00)</td>
<td>NSAID with ultrasound (Phonophores is ultrasound with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>3.52(1.02)</td>
<td>Mean Difference</td>
<td>-0.05(-0.63,0.533780)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
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<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (NCV) (Motor nerve conduction velocity)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>52.28(3.27)</td>
<td>NSAID with ultrasound (Phonophoresis) with nonsteroid anti-inflammatory drug (PNSAI)</td>
<td>23</td>
<td>53.12(5.04)</td>
<td>Mean Difference</td>
<td>-0.84(-3.30,1.615345)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (NCV) (Motor nerve conduction velocity)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>52.28(3.27)</td>
<td>Steroid with ultrasound (Phonophoresis) with corticosteroid (&quot;PCS group&quot;)</td>
<td>28</td>
<td>52.26(4.00)</td>
<td>Mean Difference</td>
<td>0.02(-1.98,2.015292)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (NCV) (Sensory nerve conduction velocity)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>37.65(10.50)</td>
<td>NSAID with ultrasound (Phonophoresis) with nonsteroid anti-inflammatory drug (PNSAI)</td>
<td>23</td>
<td>36.91(10.16)</td>
<td>Mean Difference</td>
<td>0.74(-5.23,6.711264)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
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<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (NCV)(Sensory nerve conduction velocity)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>37.65(10.50)</td>
<td>Steroid with ultrasound (Phonophoresis with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>40.44(12.83)</td>
<td>Mean Difference</td>
<td>-2.79(-9.19,3.613043)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential amplitude)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>16.86(8.56)</td>
<td>NSAID with ultrasound (Phonophoresis with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>17.95(11.27)</td>
<td>Mean Difference</td>
<td>-1.09(-6.87,4.693862)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential amplitude)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>16.86(8.56)</td>
<td>Steroid with ultrasound (Phonophoresis with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>17.7(9.04)</td>
<td>Mean Difference</td>
<td>-0.84(-5.68,4.002603)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Phalen's test score(% positive)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>52.17%</td>
<td>Steroid with ultrasound (Phonophoresis with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>50.00%</td>
<td>RR</td>
<td>1.04(0.61,1.79)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Effect Measure (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Soyupke,F., 2012</td>
<td>High Quality</td>
<td>Phalen's test score(% positive)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>52.17%</td>
<td>NSAID with ultrasound (Phonophores is (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>39.13%</td>
<td>RR</td>
<td>1.33(0.70,2.54)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupke,F., 2012</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>12.86(3.74)</td>
<td>NSAID with ultrasound (Phonophores is (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>15.86(5.65)</td>
<td>Mean Difference</td>
<td>-2.74(-5.77,-0.071306)</td>
<td>Splinting (Splinting) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Soyupke,F., 2012</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>12.86(3.74)</td>
<td>Steroid with ultrasound (Phonophores is (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>15.6(6.37)</td>
<td>Mean Difference</td>
<td>-2.74(-5.55,0.071306)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Tinel’s Sign/Test(%) positive</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>60.87%</td>
<td>NSAID with ultrasound (Phonophoresis ultrasound with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>65.22%</td>
<td>RR</td>
<td>0.93(0.60,1.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Tinel’s Sign/Test(%) positive</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>60.87%</td>
<td>Steroid with ultrasound (Phonophoresis ultrasound with corticosteroid (”PCS group”))</td>
<td>28</td>
<td>50.00%</td>
<td>RR</td>
<td>1.22(0.74,2.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Ultrasound (US)(anterior-posterior diameter of median nerve)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>2.45(0.35)</td>
<td>NSAID with ultrasound (Phonophoresis ultrasound with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>2.13(0.42)</td>
<td>Mean Difference</td>
<td>0.32(0.10,0.5434 37)</td>
<td>NSAID with ultrasound (Phonophoresis ultrasound with nonsteroid anti-inflammatory drug (PNSAI)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Ultrasound (US)(anterior-posterior diameter of median nerve)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>2.45(0.35)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>2.07(0.41)</td>
<td>Mean Difference</td>
<td>0.38(0.17,0.5886 24)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;)) (P-value&lt;.05)</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Ultrasound (US)(cross-sectional area of median nerve)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>0.12(0.03)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>0.1(0.03)</td>
<td>Mean Difference</td>
<td>0.02(0.00,0.0365 47)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Ultrasound (US)(cross-sectional area of median nerve)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>0.12(0.03)</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>0.11(0.02)</td>
<td>Mean Difference</td>
<td>0.01(- 0.00,0.024735)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Ultrasound (US)(transverse diameter of median nerve)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>6.82(1.03)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>6.61(1.20)</td>
<td>Mean Difference</td>
<td>0.21(- 0.40,0.822181)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Treatment 2 (Details)</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Ultrasound (US)(transverse diameter of median nerve)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>6.82(1.03)</td>
<td>NSAID with ultrasound (Phonophoresis with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>6.74(0.91)</td>
<td>Mean Difference</td>
<td>0.08(-0.48,0.641704)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yagci,I., 2009</td>
<td>High Quality</td>
<td>Grip strength(Kilograms)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>24</td>
<td>26.83(7.16)</td>
<td>Laser (w/splinting) (Splinting + Low-Level Laser Therapy)</td>
<td>21</td>
<td>30.49(6.93)</td>
<td>Mean Difference</td>
<td>-3.66(-7.78,0.462046)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yagci,I., 2009</td>
<td>High Quality</td>
<td>NCS (CMAP)(Compound muscle action potential)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>24</td>
<td>11.94(2.83)</td>
<td>Laser (w/splinting) (Splinting + Low-Level Laser Therapy)</td>
<td>21</td>
<td>10.3(2.15)</td>
<td>Mean Difference</td>
<td>1.64(0.18,3.098618)</td>
<td>Splinting (Splinting) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Yagci,I., 2009</td>
<td>High Quality</td>
<td>NCS (DML)(Median motor nerve distal latency)</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>24</td>
<td>3.41(0.45)</td>
<td>Laser (w/splinting) (Splinting + Low-Level Laser Therapy)</td>
<td>21</td>
<td>3.55(0.53)</td>
<td>Mean Difference</td>
<td>-0.14(-0.43,0.149481)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yagci,I., 2009</td>
<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential (palm-wrist median))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>24</td>
<td>31.64(5.36)</td>
<td>Laser (w/splinting) (Splinting + Low-Level Laser Therapy)</td>
<td>21</td>
<td>32.7(7.41)</td>
<td>Mean Difference</td>
<td>-1.06(-4.89,2.766639)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Yagci, I., 2009</td>
<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential amplitude (3rd digit-wrist median))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>24</td>
<td>34.27(8.27)</td>
<td>Laser (w/ splinting) (Splinting + Low-Level Laser Therapy)</td>
<td>21</td>
<td>35.52(12.49)</td>
<td>Mean Difference</td>
<td>-1.25(-7.53,5.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Yagci, I., 2009</td>
<td>High Quality</td>
<td>NCS (SNCV)(Sensory nerve conduction velocity (3rd digit-wrist))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>24</td>
<td>43.16(5.06)</td>
<td>Laser (w/ splinting) (Splinting + Low-Level Laser Therapy)</td>
<td>21</td>
<td>43.47(6.09)</td>
<td>Mean Difference</td>
<td>-0.31(-3.61,2.99)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yagci, I., 2009</td>
<td>High Quality</td>
<td>NCS (SNCV)(Sensory nerve conduction velocity (Palm-wrist))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>24</td>
<td>38.86(4.49)</td>
<td>Laser (w/ splinting) (Splinting + Low-Level Laser Therapy)</td>
<td>21</td>
<td>38.54(7.01)</td>
<td>Mean Difference</td>
<td>0.32(-3.18,3.81)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>24</td>
<td>2.38(0.71)</td>
<td>Laser (w/ splinting) (Splinting + Low-Level Laser Therapy)</td>
<td>21</td>
<td>2.1(0.63)</td>
<td>Mean Difference</td>
<td>0.28(-0.11,0.67)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Outcome Details</td>
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<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Purdue pegboard test score(t (minutes))</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>51.4(15.30)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>53.72(11.29)</td>
<td>Mean Difference</td>
<td>-2.32(-9.42,4.777799)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Purdue pegboard test score(t (minutes))</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>Mean change= 4.53 (p value = 0.477)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>Mean change= 12.91 (p value = 0.582)</td>
<td>Difference between Mean Changes</td>
<td>8.38 (p value =0.021)</td>
<td>Splint (Splint) (P-value&gt;.05)</td>
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<tr>
<td>Manente,G., 2001</td>
<td>High Quality</td>
<td>Questionnaire (GICQ)(Global Impression Change Questionnaire)</td>
<td>1 month</td>
<td>Brace (Immobilization-brace)</td>
<td>40</td>
<td>. %</td>
<td>No brace (Non-immobilization-no brace)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Brace (Immobilization-brace) (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(VAS pain)</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>4.26(2.67)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>5.65(2.54)</td>
<td>Mean Difference</td>
<td>-1.39(-2.78,0.004835)</td>
<td>Splint (Splint) (P-value&gt;.05)</td>
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<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(VAS pain)</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>Mean change=-1.58 (p value = 0.001)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>Mean change=0.65 (p value = 0.118)</td>
<td>Difference between Mean Changes</td>
<td>2.23 (p value =0.001)</td>
<td>Splint (Splint) (P-value&gt;.05)</td>
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<td>Soyuke,F., 2012</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)()</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>37.91(23.94)</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>45.65(23.65)</td>
<td>Mean Difference</td>
<td>-7.74(-21.49,6.013110)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Soyuke,F., 2012</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)()</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>37.91(23.94)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>30.35(18.15)</td>
<td>Mean Difference</td>
<td>7.56(-4.31,19.43111)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Hall,B., 2013</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>1.8 months</td>
<td>Splint (Splint)</td>
<td>30</td>
<td>2.38(0.77)</td>
<td>No splint (No splint)</td>
<td>24</td>
<td>2.6(0.62)</td>
<td>Mean Difference</td>
<td>-0.22(-0.59,0.150745)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Manente,G., 2001</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>1 month</td>
<td>Brace (Immobilization-brace)</td>
<td>40</td>
<td>1.54(0.40)</td>
<td>No brace (Non-immobilization-no brace)</td>
<td>40</td>
<td>2.61(0.60)</td>
<td>Mean Difference</td>
<td>0.45 (p value &lt;0.001)</td>
<td>Brace (Immobilization-brace) (P-value&lt;.05)</td>
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<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>14.08(6.67)</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>26(5.43)</td>
<td>Mean Difference</td>
<td>-11.92(-15.44,-8.40495)</td>
<td>Splinting (Splinting) (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>23</td>
<td>14.08(6.67)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>23.46(5.95)</td>
<td>Mean Difference</td>
<td>-9.38(-12.89,-5.87457)</td>
<td>Splinting (Splinting) (P-value&lt;.05)</td>
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<td>Yagci,I., 2009</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>3 months</td>
<td>Splinting (Splinting)</td>
<td>24</td>
<td>2.35(0.65)</td>
<td>Laser (w/ splinting) (Splinting + Low-Level Laser Therapy)</td>
<td>21</td>
<td>2.25(0.79)</td>
<td>Mean Difference</td>
<td>0.1(-0.33,0.527054)</td>
<td>Not Significant (P-value&gt;.05)</td>
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### Table 118: PICO 6 Part 2 - Injection (Steroid): Complications

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P 1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P 2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Treatment Failure (Rate of surgery @ 1 year)</td>
<td>1 years</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>81.08%</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>72.97%</td>
<td>RR</td>
<td>1.11 (0.87, 1.43)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Treatment Failure (Rate of surgery @ 1 year)</td>
<td>1 years</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>81.08%</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>72.97%</td>
<td>RR</td>
<td>1.11 (0.87, 1.43)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Treatment Failure (Rate of surgery @ 1 year)</td>
<td>1 years</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>72.97%</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>72.97%</td>
<td>RR</td>
<td>1.00 (0.76, 1.32)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Dammers, J.W., 2006</td>
<td>High Quality</td>
<td>Treatment Failure (Referred to surgery)</td>
<td>5.9 months</td>
<td>Steroid (injection)-20mg (20mg Methylprednisol one injection)</td>
<td>45</td>
<td>13.33%</td>
<td>Steroid (injection)-40mg (40mg Methylprednisol one injection)</td>
<td>43</td>
<td>6.98%</td>
<td>RR</td>
<td>1.91 (0.51, 7.16)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Dammers, J.W., 2006</td>
<td>High Quality</td>
<td>Treatment Failure (Referred to surgery)</td>
<td>5.9 months</td>
<td>Steroid (injection)-20mg (20mg Methylprednisol one injection)</td>
<td>45</td>
<td>13.33%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisol one injection)</td>
<td>44</td>
<td>6.82%</td>
<td>RR</td>
<td>1.96 (0.52, 7.34)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Reference Title</td>
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<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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<td>High Quality</td>
<td>Treatment Failure(Second Injection)</td>
<td>5.9 months</td>
<td>Steroid (injection)-20mg (20mg Methylprednisol one injection)</td>
<td>45</td>
<td>28.89%</td>
<td>Steroid (injection)-40mg (40mg Methylprednisol one injection)</td>
<td>43</td>
<td>39.53%</td>
<td>RR</td>
<td>0.73(0.41,1.32)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Dammers,J. W., 2006</td>
<td>High Quality</td>
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<td>5.9 months</td>
<td>Steroid (injection)-20mg (20mg Methylprednisol one injection)</td>
<td>45</td>
<td>28.89%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisol one injection)</td>
<td>44</td>
<td>18.18%</td>
<td>RR</td>
<td>1.59(0.73,3.45)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Dammers,J. W., 2006</td>
<td>High Quality</td>
<td>Treatment Failure(Second Injection)</td>
<td>1 years</td>
<td>Steroid (injection)-20mg (20mg Methylprednisol one injection)</td>
<td>45</td>
<td>13.33%</td>
<td>Steroid (injection)-40mg (40mg Methylprednisol one injection)</td>
<td>43</td>
<td>9.30%</td>
<td>RR</td>
<td>1.43(0.43,4.73)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Steroid (injection)-20mg (20mg Methylprednisol one injection)</td>
<td>45</td>
<td>13.33%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisol one injection)</td>
<td>44</td>
<td>9.09%</td>
<td>RR</td>
<td>1.47(0.44,4.85)</td>
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<td>Treatment Failure(Second Injection)</td>
<td>1 years</td>
<td>Steroid (injection)-20mg (20mg Methylprednisol one injection)</td>
<td>45</td>
<td>37.78%</td>
<td>Steroid (injection)-40mg (40mg Methylprednisol one injection)</td>
<td>43</td>
<td>48.84%</td>
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<td>45</td>
<td>37.78%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisol one injection)</td>
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<td>36.36%</td>
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<td>1.04(0.60,1.79)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Steroid (injection)-20mg (20mg Methylprednisol one injection)</td>
<td>45</td>
<td>37.78%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisol one injection)</td>
<td>44</td>
<td>6.82%</td>
<td>RR</td>
<td>1.02(0.22,4.79)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Dammers, J. W., 2006</td>
<td>High Quality</td>
<td>Treatment Failure(Second Injection)</td>
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<td>Steroid (injection)-40mg (40mg Methylprednisol one injection)</td>
<td>43</td>
<td>39.53%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisol one injection)</td>
<td>44</td>
<td>18.18%</td>
<td>RR</td>
<td>2.17(1.05,4.50)</td>
<td>Steroid (injection)-60mg (60mg Methylprednisol one injection) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Dammers, J. W., 2006</td>
<td>High Quality</td>
<td>Treatment Failure(Referr ed to surgery)</td>
<td>1 years</td>
<td>Steroid (injection)-40mg (40mg Methylprednisol one injection)</td>
<td>43</td>
<td>9.30%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisol one injection)</td>
<td>44</td>
<td>9.09%</td>
<td>RR</td>
<td>1.02(0.27,3.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dammers, J. W., 2006</td>
<td>High Quality</td>
<td>Treatment Failure(Second Injection)</td>
<td>1 years</td>
<td>Steroid (injection)-40mg (40mg Methylprednisol one injection)</td>
<td>43</td>
<td>48.84%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisol one injection)</td>
<td>44</td>
<td>36.36%</td>
<td>RR</td>
<td>1.34(0.82,2.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>2.3 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>2.3(4.40)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>0.1(6.00)</td>
<td>Mean Difference</td>
<td>2.2(-0.24,4.641608)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>2.3 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>2.3(4.40)</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>2.8(4.10)</td>
<td>Mean Difference</td>
<td>-0.5(-2.451.450360)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>1 years</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>1.6(8.70)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>0.6(5.10)</td>
<td>Mean Difference</td>
<td>1(-2.254.249493)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>1 years</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>1.6(8.70)</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>1.9(7.50)</td>
<td>Mean Difference</td>
<td>-0.3(-4.003.401207)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>2.3 months</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>2.8(4.10)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>0.1(6.00)</td>
<td>Mean Difference</td>
<td>2.7(0.305.096909)</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid)) Significant (P-value &lt;.05)</td>
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<td>Duration</td>
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<td>Group N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>1 years</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>1.9(7.50 )</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>0.6(5.10 )</td>
<td>Mean Difference</td>
<td>1.3(-1.62,4.222466)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>2.3 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>0.7(1.50 )</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>0.3(1.40 )</td>
<td>Mean Difference</td>
<td>0.4(-0.27,1.069880)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>2.3 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>0.7(1.50 )</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>1.2(1.10 )</td>
<td>Mean Difference</td>
<td>-0.5(-1.10,0.102271)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>1 years</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>1.3(1.90 )</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>1.1(1.50 )</td>
<td>Mean Difference</td>
<td>0.2(-0.58,0.980016)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>1 years</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>1.3(1.90 )</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>1.5(1.80 )</td>
<td>Mean Difference</td>
<td>-0.2(-1.04,0.643335)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Grou p1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Grou p2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>2.3 months</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>1.2(1.10)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>0.3(1.40)</td>
<td>Mean Difference</td>
<td>0.9(0.31,1.4867 28)</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid)) (P-value&lt;.05)</td>
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<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>1 years</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>1.5(1.80)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>1.1(1.50)</td>
<td>Mean Difference</td>
<td>0.4(-0.35,1.154990)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Two-point discrimination (Millimeters)</td>
<td>2.3 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>-0.06(1.00)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>0.02(0.90)</td>
<td>Mean Difference</td>
<td>-0.08(-0.52,0.359013)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Two-point discrimination (Millimeters)</td>
<td>2.3 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>-0.06(1.00)</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>-0.07(1.50)</td>
<td>Mean Difference</td>
<td>0.01(-0.58,0.596452)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Two-point discrimination (Millimeters)</td>
<td>1 years</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>-0.26(0.90)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>-0.47(0.90)</td>
<td>Mean Difference</td>
<td>0.21(-0.20,0.620121)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference</td>
<td>Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Two-point discrimination (Millimeters)</td>
<td>1 years</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>Mean Difference</td>
<td>0.08(-0.29,0.447389)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Two-point discrimination (Millimeters)</td>
<td>2.3 months</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>Mean Difference</td>
<td>-0.09(-0.66,0.483590)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Two-point discrimination (Millimeters)</td>
<td>1 years</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>Mean Difference</td>
<td>0.13(-0.24,0.497389)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Wong,S.M., 2005</td>
<td>High Quality</td>
<td>Grip strength (Kilograms (left hand))</td>
<td>1.8 months</td>
<td>Steroid (single injection) (Single injection (methylprednisol one acetate))</td>
<td>Steroid (double injection) (Double injection (methylprednisol one acetate+saline))</td>
<td>Mean Difference</td>
<td>-0.2(-3.72,3.318459)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Wong,S.M., 2005</td>
<td>High Quality</td>
<td>Grip strength (Kilograms (right hand))</td>
<td>1.8 months</td>
<td>Steroid (single injection) (Single injection (methylprednisol one acetate))</td>
<td>Steroid (double injection) (Double injection (methylprednisol one acetate+saline))</td>
<td>Mean Difference</td>
<td>-1(-5.16,3.164250)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Duration</td>
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<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Wong,S.M., 2005</td>
<td>High Quality</td>
<td>Grip strength (left hand)</td>
<td>9.2 months</td>
<td>Steroid (single injection) (Single injection (methylprednisolone acetate))</td>
<td>Steroid (double injection) (Double injection (methylprednisolone acetate+saline))</td>
<td>Mean Difference</td>
<td>2(-2.09, 6.090722)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Wong,S.M., 2005</td>
<td>High Quality</td>
<td>Grip strength (right hand)</td>
<td>9.2 months</td>
<td>Steroid (single injection) (Single injection (methylprednisolone acetate))</td>
<td>Steroid (double injection) (Double injection (methylprednisolone acetate+saline))</td>
<td>Mean Difference</td>
<td>1.4(-)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Wong,S.M., 2005</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (right hand))</td>
<td>NA</td>
<td>Steroid (single injection) (Single injection (methylprednisolone acetate))</td>
<td>Steroid (double injection) (Double injection (methylprednisolone acetate+saline))</td>
<td>Mean Difference</td>
<td>-0.9(-1.84, 0.041004)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Wong,S.M., 2005</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (left hand))</td>
<td>1.8 months</td>
<td>Steroid (single injection) (Single injection (methylprednisolone acetate))</td>
<td>Steroid (double injection) (Double injection (methylprednisolone acetate+saline))</td>
<td>Mean Difference</td>
<td>0.1(-0.52, 0.722897)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Wong,S.M., 2005</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (right hand))</td>
<td>1.8 months</td>
<td>Steroid (single injection) (Single injection (methylprednisolone acetate))</td>
<td>Steroid (double injection) (Double injection (methylprednisolone acetate+saline))</td>
<td>Mean Difference</td>
<td>-0.5(-1.29, 0.290101)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Wong.S.M., 2005</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (left hand))</td>
<td>9.2 months</td>
<td>Steroid (single injection) (Single injection (methylprednisol one acetate))</td>
<td>20</td>
<td>4.2(1.10 )</td>
<td>Steroid (double injection) (Double injection (methylprednisol one acetate+saline))</td>
<td>20</td>
<td>4.5(1.00 )</td>
<td>Mean Difference</td>
<td>-0.3(-0.95,0.351534)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Wong.S.M., 2005</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (right hand))</td>
<td>9.2 months</td>
<td>Steroid (single injection) (Single injection (methylprednisol one acetate))</td>
<td>20</td>
<td>4.3(1.00 )</td>
<td>Steroid (double injection) (Double injection (methylprednisol one acetate+saline))</td>
<td>20</td>
<td>5.2(1.50 )</td>
<td>Mean Difference</td>
<td>-0.9(-1.69,-0.10989)</td>
<td>Steroid (single injection) (Single injection (methylprednisol one acetate)) (P-value&lt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (SF-6D score)</td>
<td>1.2 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>0.14 (0.14)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>0.06 (0.10)</td>
<td>Mean Difference</td>
<td>0.08 (0.02, 0.1354 37)</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid)) (P-value &lt; .05)</td>
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<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (SF-6D score)</td>
<td>1.2 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>0.14 (0.14)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>0.1 (0.10)</td>
<td>Mean Difference</td>
<td>0.04 (-0.02, 0.095696)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>High Quality</td>
<td>Questionnaire (General/undefined) (SF-6D score)</td>
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<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
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<td>0.08 (0.15)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>0 (0.11)</td>
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<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid)) (P-value &lt; .05)</td>
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<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
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<td>0.06 (0.10)</td>
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<td>0.02 (-0.04, 0.078337)</td>
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<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(SF-6D score)</td>
<td>5.5 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>0.07(0.12)</td>
<td>No steroid (placebo) (Placebo injection)</td>
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<td>0.09(0.16)</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>0.07(0.12)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>0.08(0.12)</td>
<td>Mean Difference</td>
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<td>1 year</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>0.11(0.13)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>0.1(0.17)</td>
<td>Mean Difference</td>
<td>0.01(-0.06,0.078958)</td>
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<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>0.11(0.13)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>0.12(0.15)</td>
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<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>0.1(0.10)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
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<td>Mean Difference</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>36</td>
<td>0.06(0.10)</td>
<td>No steroid (placebo) (Placebo injection)</td>
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<td>0(0.11)</td>
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<td>Atroshi, I., 2013</td>
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<td>Questionnaire (General/undefined)(SF-6D score)</td>
<td>5.5 months</td>
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<td>36</td>
<td>0.08(0.12)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>0.09(0.16)</td>
<td>Mean Difference</td>
<td>-0.01(-0.08,0.055927)</td>
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<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
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<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Atroshi, I., 2013</td>
<td>Questionnaire (General/undefined)(SF-36 bodily pain score)</td>
<td>1.2 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>30(32.60)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>8.8(18.90)</td>
<td>Mean Difference</td>
<td>21.2(9.06,33.34212)</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid)) (P-value &lt; .05)</td>
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<td>Questionnaire (General/undefined)(SF-36 bodily pain score)</td>
<td>1.2 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>30(32.60)</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>34.3(29.50)</td>
<td>Mean Difference</td>
<td>-4.3(-18.56,9.955123)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Atroshi, I., 2013</td>
<td>Questionnaire (General/undefined)(SF-36 bodily pain score)</td>
<td>2.3 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>24.6(29.90)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>3.3(25.00)</td>
<td>Mean Difference</td>
<td>21.3(8.59,34.00521)</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid)) (P-value &lt; .05)</td>
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<td>Questionnaire (General/undefined)(SF-36 bodily pain score)</td>
<td>2.3 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>24.6(29.90)</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>23.4(28.50)</td>
<td>Mean Difference</td>
<td>1.2(-12.20,14.59770)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (SF-36 bodily pain score)</td>
<td>5.5 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>19.6(28.40)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>25.3(27.40)</td>
<td>Mean Difference</td>
<td>-5.7(-18.59,7.19768)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Questionnaire (General/undefined) (SF-36 bodily pain score)</td>
<td>5.5 months</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>19.6(28.40)</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>28.8(30.10)</td>
<td>Mean Difference</td>
<td>-9.2(-22.63,4.232202)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Questionnaire (General/undefined) (SF-36 bodily pain score)</td>
<td>1 year</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>30(32.60)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>29.3(33.00)</td>
<td>Mean Difference</td>
<td>0.7(-14.25,15.6493)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Atroshi, I., 2013</td>
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<td>1 year</td>
<td>40mg Methylprednisol one injection (40mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>30(32.60)</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>34.3(29.50)</td>
<td>Mean Difference</td>
<td>-4.3(-18.47,9.866816)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>1.2 months</td>
<td>80mg Methylprednisol one injection (80mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>34.3(29.50)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>8.8(18.90)</td>
<td>Mean Difference</td>
<td>25.5(14.10,36.89971)</td>
<td>Not Significant (P-value&lt;.05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Questionnaire (General/undefined) (SF-36 bodily pain score)</td>
<td>2.3 months</td>
<td>80 mg Methylprednisol one injection (80 mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>23.4(28.50)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>3.3(25.00)</td>
<td>Mean Difference</td>
<td>20.1(7.64,32.56098)</td>
<td>80 mg Methylprednisol one injection (80 mg Methylprednisol one injection (corticosteroid)) (P-value&lt;.05)</td>
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<td>High Quality</td>
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<td>5.5 months</td>
<td>80 mg Methylprednisol one injection (80 mg Methylprednisol one injection (corticosteroid))</td>
<td>36</td>
<td>28.8(30.10)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>25.3(27.40)</td>
<td>Mean Difference</td>
<td>3.5(-9.88,16.88225)</td>
<td>80 mg Methylprednisol one injection (80 mg Methylprednisol one injection (corticosteroid)) (P-value&gt;.05)</td>
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<td>High Quality</td>
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<td>1 year</td>
<td>80 mg Methylprednisol one injection (80 mg Methylprednisol one injection (corticosteroid))</td>
<td>37</td>
<td>34.3(29.50)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>29.3(33.00)</td>
<td>Mean Difference</td>
<td>5(-9.26,19.26264)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Quality</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Mean1/P1 (SD1)</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(CTS symptom severity score)</td>
<td>1.2 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37 - 1.33(0.98)</td>
<td>37 - 0.47(0.60)</td>
<td>Mean Difference</td>
<td>-0.86(-1.23, -0.48973)</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid)) (P-value&lt;.05)</td>
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<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(CTS symptom severity score)</td>
<td>1.2 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>37 - 1.33(0.98)</td>
<td>36 - 1.12(0.93)</td>
<td>Mean Difference</td>
<td>-0.21(-0.65, 0.228189)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(CTS symptom severity score)</td>
<td>2.3 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37 - 1.17(0.95)</td>
<td>35 - 0.3(0.66)</td>
<td>Mean Difference</td>
<td>-0.87(-1.25, -0.49381)</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid)) (P-value&lt;.05)</td>
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<td>Atroshi,I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(CTS symptom severity score)</td>
<td>2.3 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>37 - 1.17(0.95)</td>
<td>36 - 0.9(1.00)</td>
<td>Mean Difference</td>
<td>-0.27(-0.72, 0.17767)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(CTS symptom severity score)</td>
<td>5.5 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>1.16(0.86)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>-1.49(0.82)</td>
<td>Mean Difference</td>
<td>0.33(-0.06,0.718063)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Atroshi, I., 2013</td>
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<td>Questionnaire (General/undefined)(CTS symptom severity score)</td>
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<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>1.16(0.86)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>-1.22(0.93)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Atroshi, I., 2013</td>
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<td>37</td>
<td>1.52(1.08)</td>
<td>No steroid (placebo) (Placebo injection)</td>
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<td>Mean Difference</td>
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<td>Atroshi, I., 2013</td>
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<td>37</td>
<td>1.52(1.08)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(CTS symptom severity score)</td>
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<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>1.12(0.93)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>-0.47(0.60)</td>
<td>Mean Difference</td>
<td>-0.65(-1.01, -0.28989)</td>
<td>Not Significant (P-value&gt;.05)</td>
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80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid)) (P-value<.05)
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
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<th>Mean1/P 1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P 2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(CTS symptom severity score)</td>
<td>2.3 months</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>- 0.9(1.00)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>- 0.3(0.66)</td>
<td>Mean Difference</td>
<td>-0.6(-0.99, -0.20690)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid)) (P-value&lt;.05)</td>
</tr>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(CTS symptom severity score)</td>
<td>5.5 months</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>- 1.22(0.93)</td>
<td>No steroid (placebo) (Placebo injection)</td>
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<td>- 1.49(0.82)</td>
<td>Mean Difference</td>
<td>0.27(-0.14,0.677550)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>1 years</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>- 1.37(0.86)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>- 1.55(0.79)</td>
<td>Mean Difference</td>
<td>0.18(-0.20,0.556283)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH)(Primarily symptomatic domain but includes a functional component as well)</td>
<td>1.2 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>- 22.6(20.50)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>- 9.8(12.90)</td>
<td>Mean Difference</td>
<td>-12.8(-20.60,-4.99543)</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid)) (P-value&lt;.05)</td>
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<td>Atroshi, I., 2013</td>
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<td>Questionnaire (DASH-Quick DASH)(Primarily symptomatic domain but includes a functional component as well)</td>
<td>1.2 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>- 22.6(20.50)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>- 20.2(17.60)</td>
<td>Mean Difference</td>
<td>-2.4(-11.16,6.357176)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>2.3 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>19.4(24.70)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>4.1(14.50)</td>
<td>Mean Difference</td>
<td>-15.3(-24.60,-6.00371)</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid)) (P-value&lt;.05)</td>
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<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>2.3 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>19.4(24.70)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>15.5(19.40)</td>
<td>Mean Difference</td>
<td>-3.9(-14.07,6.2737)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>5.5 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>16.8(17.60)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>35</td>
<td>25.3(22.80)</td>
<td>Mean Difference</td>
<td>8.5(-0.95,17.9455)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>5.5 months</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>16.8(17.60)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>36</td>
<td>19.2(22.10)</td>
<td>Mean Difference</td>
<td>2.4(-6.78,11.5804)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Atroshi, I., 2013</td>
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<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>1 years</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>37</td>
<td>27.3(20.90)</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>37</td>
<td>28.7(21.90)</td>
<td>Mean Difference</td>
<td>1.4(-8.35,11.1544)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
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<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>1 year</td>
<td>40mg Methylprednisolone injection (40mg Methylprednisolone injection (corticosteroid))</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>Mean Difference</td>
<td>-1.3 (-10.27, 7.6724 22)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>1.2 months</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>Mean Difference</td>
<td>-10.4 (-17.49, -3.30544)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid)) (P-value &lt; .05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>2.3 months</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>Mean Difference</td>
<td>-11.4 (-19.35, -3.44771)</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid)) (P-value &lt; .05)</td>
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<tr>
<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>5.5 months</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>Mean Difference</td>
<td>6.1 (-4.35, 16.5487 5)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Atroshi, I., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH-Quick DASH) (Primarily symptomatic domain but includes a functional component as well)</td>
<td>1 year</td>
<td>80mg Methylprednisolone injection (80mg Methylprednisolone injection (corticosteroid))</td>
<td>No steroid (placebo) (Placebo injection)</td>
<td>Mean Difference</td>
<td>2.7 (-6.52, 11.9167 3)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Reference Title</td>
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<tr>
<td>Dammers,J. W., 2006</td>
<td>High Quality</td>
<td>Symptom relief (general)(No or only minor symptoms requiring no further treatment)</td>
<td>5.9 months</td>
<td>Steroid (injection)-20mg (20mg Methylprednisolone injection)</td>
<td>45</td>
<td>55.56%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisolone injection)</td>
<td>44</td>
<td>72.73%</td>
<td>RR</td>
<td>0.76(0.56,1.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Dammers,J. W., 2006</td>
<td>High Quality</td>
<td>Symptom relief (general)(No or only minor symptoms requiring no further treatment)</td>
<td>5.9 months</td>
<td>Steroid (injection)-20mg (20mg Methylprednisolone injection)</td>
<td>45</td>
<td>55.56%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisolone injection)</td>
<td>44</td>
<td>53.49%</td>
<td>RR</td>
<td>1.04(0.71,1.52)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Dammers,J. W., 2006</td>
<td>High Quality</td>
<td>Symptom relief (general)(No or only minor symptoms requiring no further treatment)</td>
<td>1 years</td>
<td>Steroid (injection)-20mg (20mg Methylprednisolone injection)</td>
<td>45</td>
<td>46.67%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisolone injection)</td>
<td>44</td>
<td>52.27%</td>
<td>RR</td>
<td>0.89(0.59,1.36)</td>
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<td>Dammers,J. W., 2006</td>
<td>High Quality</td>
<td>Symptom relief (general)(No or only minor symptoms requiring no further treatment)</td>
<td>1 years</td>
<td>Steroid (injection)-20mg (20mg Methylprednisolone injection)</td>
<td>45</td>
<td>46.67%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisolone injection)</td>
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<td>41.86%</td>
<td>RR</td>
<td>1.11(0.70,1.79)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Dammers,J. W., 2006</td>
<td>High Quality</td>
<td>Symptom relief (general)(No or only minor symptoms requiring no further treatment)</td>
<td>5.9 months</td>
<td>Steroid (injection)-40mg (40mg Methylprednisolone injection)</td>
<td>43</td>
<td>53.49%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisolone injection)</td>
<td>44</td>
<td>72.73%</td>
<td>RR</td>
<td>0.74(0.53,1.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Dammers,J. W., 2006</td>
<td>High Quality</td>
<td>Symptom relief (general)(No or only minor symptoms requiring no further treatment)</td>
<td>1 years</td>
<td>Steroid (injection)-40mg (40mg Methylprednisolone injection)</td>
<td>43</td>
<td>41.86%</td>
<td>Steroid (injection)-60mg (60mg Methylprednisolone injection)</td>
<td>44</td>
<td>52.27%</td>
<td>RR</td>
<td>0.80(0.51,1.26)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<tr>
<td>Wong,S.M., 2001</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS)( )</td>
<td>1.8 months</td>
<td>Steroid (injection) (prednisolone 25 mg daily for 10 days and the same volume of saline injection into the carpal tunnel)</td>
<td>30</td>
<td>13.67(8.27)</td>
<td>Steroid (oral) (oral placebo daily for 10 days and a single 15-mg methylprednisolone acetate injection locally into the carpal tunnel)</td>
<td>30</td>
<td>20.83(8.73)</td>
<td>Mean Difference</td>
<td>-7.16(-11.46,-2.85683)</td>
<td>Steroid (injection) (prednisolone 25 mg daily for 10 days and the same volume of saline injection into the carpal tunnel) (P-value&lt;.05)</td>
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<td>Wong,S.M., 2001</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS)( )</td>
<td>2.8 months</td>
<td>Steroid (injection) (prednisolone 25 mg daily for 10 days and the same volume of saline injection into the carpal tunnel)</td>
<td>30</td>
<td>14.3(8.42)</td>
<td>Steroid (oral) (oral placebo daily for 10 days and a single 15-mg methylprednisolone acetate injection3 locally into the carpal tunnel)</td>
<td>30</td>
<td>21.4(9.64)</td>
<td>Mean Difference</td>
<td>-7.1(-11.68,-2.51977)</td>
<td>Steroid (injection) (prednisolone 25 mg daily for 10 days and the same volume of saline injection into the carpal tunnel) (P-value&lt;.05)</td>
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<tr>
<td>Wong,S.M., 2005</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS)(Both hands)</td>
<td>1.8 months</td>
<td>Steroid (single injection) (Single injection (methylprednisolone acetate))</td>
<td>20</td>
<td>15.2(9.90)</td>
<td>Steroid (double injection) (Double injection (methylprednisolone acetate+saline))</td>
<td>20</td>
<td>11.4(7.60)</td>
<td>Mean Difference</td>
<td>3.8(-1.679.269945)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Wong,S.M., 2005</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS)(Both hands)</td>
<td>5.5 months</td>
<td>Steroid (single injection) (Single injection (methylprednisolone acetate))</td>
<td>20</td>
<td>15.9(10.60)</td>
<td>Steroid (double injection) (Double injection (methylprednisolone acetate+saline))</td>
<td>20</td>
<td>13(9.70)</td>
<td>Mean Difference</td>
<td>2.9(-3.409.197214)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Wong, S.M., 2005</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS)(Both hands)</td>
<td>9.2 months</td>
<td>Steroid (single injection) (Single injection (methylprednisolone acetate))</td>
<td>20</td>
<td>12.6(9.10 )</td>
<td>Steroid (double injection) (Double injection (methylprednisolone acetate+saline))</td>
<td>20</td>
<td>14.1(11.0 0)</td>
<td>Mean Difference</td>
<td>-1.5(-7.76,4.75682 2)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Chang,M.H., 1998</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS) (Global symptom score)</td>
<td>1 month</td>
<td>Steroid (Steroid)</td>
<td>23</td>
<td>10(7.50)</td>
<td>Placebo (Placebo)</td>
<td>16</td>
<td>20.8(6.60)</td>
<td>Mean Difference</td>
<td>-10.8(-15.26,-6.34422)</td>
<td>Steroid (Steroid) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chang,M.H., 1998</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS) (Global symptom score)</td>
<td>1 month</td>
<td>Diuretic (oral treatment) (Diuretic (oral treatment))</td>
<td>16</td>
<td>21.6(6.30)</td>
<td>Steroid (Steroid)</td>
<td>23</td>
<td>10(7.50)</td>
<td>Mean Difference</td>
<td>11.6(7.25,15.95026)</td>
<td>Steroid (Steroid) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chang,M.H., 1998</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS) (Global symptom score)</td>
<td>1 month</td>
<td>Diuretic (oral treatment) (Diuretic (oral treatment))</td>
<td>16</td>
<td>21.6(6.30)</td>
<td>Placebo (Placebo)</td>
<td>16</td>
<td>20.8(6.60)</td>
<td>Mean Difference</td>
<td>0.8(-3.67,5.270830)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Chang,M.H., 1998</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS) (Global symptom score)</td>
<td>1 month</td>
<td>Diuretic (oral treatment) (Diuretic (oral treatment))</td>
<td>16</td>
<td>21.6(6.30)</td>
<td>NSAID (NSAID)</td>
<td>18</td>
<td>24(9.70)</td>
<td>Mean Difference</td>
<td>-2.4(-7.84,3.041549)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chang,M.H., 1998</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS) (Global symptom score)</td>
<td>1 month</td>
<td>NSAID (NSAID)</td>
<td>18</td>
<td>24(9.70)</td>
<td>Steroid (Steroid)</td>
<td>23</td>
<td>10(7.50)</td>
<td>Mean Difference</td>
<td>14(8.57,19.42919)</td>
<td>Steroid (Steroid) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chang,M.H., 1998</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS) (Global symptom score)</td>
<td>1 month</td>
<td>Placebo (Placebo)</td>
<td>16</td>
<td>20.8(6.60)</td>
<td>NSAID (NSAID)</td>
<td>18</td>
<td>24(9.70)</td>
<td>Mean Difference</td>
<td>-3.2(-8.73,2.326269)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Hui, A.C., 2011</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS)(Global symptom score)</td>
<td>1.8 months</td>
<td>Oral treatment (Gabapentin) (300 mg once daily for 1 week, 300 mg twice daily for 1 week, and from then on three times daily)</td>
<td>71</td>
<td>13.4(9.70)</td>
<td>Oral treatment (placebo) (Same as active treatment group, but a placebo)</td>
<td>69</td>
<td>12.5(8.90)</td>
<td>Mean Difference</td>
<td>0.9(-2.18,3.982365)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Chang, Y.W., 2014</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (ms))</td>
<td>1.8 months</td>
<td>Paraffin therapy (Paraffin &amp; splint)</td>
<td>43</td>
<td>4.98(1.51)</td>
<td>Ultrasound (Ultrasound &amp; splint)</td>
<td>37</td>
<td>5.08(1.30)</td>
<td>Mean Difference</td>
<td>-0.1(-0.72,0.515768)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chang, Y.W., 2014</td>
<td>High Quality</td>
<td>NCS (DSL) (Distal sensory latency (ms))</td>
<td>1.8 months</td>
<td>Paraffin therapy (Paraffin &amp; splint)</td>
<td>43</td>
<td>3.4(0.80)</td>
<td>Ultrasound (Ultrasound &amp; splint)</td>
<td>37</td>
<td>3.6(1.40)</td>
<td>Mean Difference</td>
<td>-0.2(-0.71,0.310566)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chang, Y.W., 2014</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>1.8 months</td>
<td>Paraffin therapy (Paraffin &amp; splint)</td>
<td>43</td>
<td>3.6(1.50)</td>
<td>Ultrasound (Ultrasound &amp; splint)</td>
<td>37</td>
<td>3.6(1.10)</td>
<td>Mean Difference</td>
<td>0(-0.57,0.571528)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chang, Y.W., 2014</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>1.8 months</td>
<td>Paraffin therapy (Paraffin &amp; splint)</td>
<td>23</td>
<td>1.8(0.90)</td>
<td>Ultrasound (Ultrasound &amp; splint)</td>
<td>24</td>
<td>1.6(0.70)</td>
<td>Mean Difference</td>
<td>0.2(-0.26,0.662302)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Chang, Y.W., 2014</td>
<td>High Quality</td>
<td>Semmes Weinstein Monofilaments Test (SW test) ( )</td>
<td>1.8 months</td>
<td>Paraffin therapy (Paraffin &amp; splint)</td>
<td>43</td>
<td>30.7(3.00)</td>
<td>Ultrasound (Ultrasound &amp; splint)</td>
<td>37</td>
<td>30.9(2.70)</td>
<td>Mean Difference</td>
<td>-0.2(-1.45,1.049381)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupak, F., 2012</td>
<td>High Quality</td>
<td>NCS (CMAP) (Compound muscle action potential)</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>9.97(3.34)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>10.36(2.57)</td>
<td>Mean Difference</td>
<td>-0.39(-2.05,1.274172)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>4.5(1.15)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>4.39(0.87)</td>
<td>Mean Difference</td>
<td>0.11(-0.46,0.679858)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>3.52(1.02)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>3.08(0.96)</td>
<td>Mean Difference</td>
<td>0.44(-0.11,0.987921)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (NCV)(Motor nerve conduction velocity)</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>53.12(5.04)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>52.26(4.00)</td>
<td>Mean Difference</td>
<td>0.86(-1.68,3.397307)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (NCV)(Sensory nerve conduction velocity)</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>36.91(10.16)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>40.44(12.83)</td>
<td>Mean Difference</td>
<td>-3.53(-9.84,2.780761)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential amplitude)</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>17.95(11.27)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>17.7(9.04)</td>
<td>Mean Difference</td>
<td>0.25(-5.44,5.944442)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Phalen's test score(%) positive</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>39.13%</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (PCS group))</td>
<td>28</td>
<td>50.00%</td>
<td>RR</td>
<td>0.78(0.42,1.47)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>15.86(5.65)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (PCS group))</td>
<td>28</td>
<td>15.6(6.37)</td>
<td>Mean Difference</td>
<td>0.26(-3.04,3.561369)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Tinel's Sign/Test(%) positive</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>65.22%</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (PCS group))</td>
<td>28</td>
<td>50.00%</td>
<td>RR</td>
<td>1.30(0.81,2.10)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Ultrasound (US) (anterior-posterior diameter of median nerve)</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>2.13(0.42)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (PCS group))</td>
<td>28</td>
<td>2.07(0.41)</td>
<td>Mean Difference</td>
<td>0.06(-0.17,0.289187)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Ultrasound (US) (cross-sectional area of median nerve)</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>0.11(0.02)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (PCS group))</td>
<td>28</td>
<td>0.1(0.03)</td>
<td>Mean Difference</td>
<td>0.01(-0.00,0.023794)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Reference</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Ultrasound (US)(transverse diameter of median nerve)</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>6.74(0.91)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>6.61(1.20)</td>
<td>Mean Difference</td>
<td>0.13(-0.45,0.709553)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>NCS (DML)(Median motor distal latency)</td>
<td>1.8 months</td>
<td>Sham ultrasound (w/ splinting) (Sham ultrasound+splinting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>4.32(0.60)</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>4.15(0.34)</td>
<td>Mean Difference</td>
<td>0.17(-0.16,0.497832)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>NCS (DML)(Median motor distal latency)</td>
<td>1.8 months</td>
<td>Ultrasound (w/ splinting) (Ultrasound+splinting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>4.43(0.55)</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>4.15(0.34)</td>
<td>Mean Difference</td>
<td>0.28(-0.03,0.587377)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>NCS (DSL)(Median sensory distal latency)</td>
<td>1.8 months</td>
<td>Sham ultrasound (w/ splinting) (Sham ultrasound+splinting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>3.94(0.47)</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>3.79(0.33)</td>
<td>Mean Difference</td>
<td>0.15(-0.12,0.422996)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>NCS (DSL)(Median sensory distal latency)</td>
<td>1.8 months</td>
<td>Ultrasound (w/ splinting) (Ultrasound+splinting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>3.87(0.29)</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>3.79(0.33)</td>
<td>Mean Difference</td>
<td>0.08(-0.13,0.288838)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(FSS)</td>
<td>1.8 months</td>
<td>Sham ultrasound (w/ splinting) (Sham ultrasound+splinting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>2.19(0.89)</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>1.79(0.80)</td>
<td>Mean Difference</td>
<td>0.4(-0.17,0.968876)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Yildiz, N., 2011</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (FSS)</td>
<td>1.8 months</td>
<td>Ultrasound (w/ splinting) (Ultrasound+splinting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>1.98(0.78)</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>1.79(0.80)</td>
<td>Mean Difference</td>
<td>0.19(-0.34, 0.721139)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Chang,Y. W., 2014</td>
<td>High Quality</td>
<td>Questionnaire /Scale (VAS-pain)(0-100)</td>
<td>1.8 months</td>
<td>Paraffin therapy (Paraffin &amp; splint)</td>
<td>23</td>
<td>50.7(22.70 )</td>
<td>Ultrasound (Ultrasound &amp; splint)</td>
<td>24</td>
<td>54.2(22.60 )</td>
<td>Mean Difference -3.5(-16.45,9.454633)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Questionnaire /Scale (VAS-pain)( )</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>45.65(23.65)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>30.35(18.15)</td>
<td>Mean Difference 15.3(3.53,27.07362)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;)) (P-value&lt;.05)</td>
<td></td>
</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>Questionnaire /Scale (VAS-pain)( )</td>
<td>1.8 months</td>
<td>Sham ultrasound (w/ splinting) (Sham ultrasound+splinting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>3.28(2.74)</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>0.98(1.65)</td>
<td>Mean Difference 2.3(0.78,3.820447)</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data) (P-value&lt;.05)</td>
<td></td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1</td>
<td>Treatment 2 (Details)</td>
<td>Group 2</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>Questionnaire /Scale (VAS-pain)()</td>
<td>1.8 months</td>
<td>Ultrasound (w/ splinting) (Ultrasound+splinting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>Mean Difference</td>
<td>1.79(0.27,3.310447)</td>
<td>Ketoprofen phonophoresis (w/ splinting) (Ketoprofen phonophoresis (w/ splinting). Included the intention-intention-to-treat analysis data) (P-value&lt;.05)</td>
<td></td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Chang,Y.W., 2014</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS) (Boston CTS Questionnaire (symptom severity scale))</td>
<td>1.8 months</td>
<td>Paraffin therapy (Paraffin &amp; splint)</td>
<td>23</td>
<td>1.9(0.70)</td>
<td>Ultrasound (Ultrasound &amp; splint)</td>
<td>24</td>
<td>2.1(0.80)</td>
<td>Mean Difference</td>
<td>-0.2(-0.63,0.229284)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Soyupek,F., 2012</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS) (Boston CTS Questionnaire (symptom severity scale))</td>
<td>3 months</td>
<td>NSAID with ultrasound (Phonophoresis (ultrasound) with nonsteroid anti-inflammatory drug (PNSAI))</td>
<td>23</td>
<td>26(5.43)</td>
<td>Steroid with ultrasound (Phonophoresis (ultrasound) with corticosteroid (&quot;PCS group&quot;))</td>
<td>28</td>
<td>23.46(5.95)</td>
<td>Mean Difference</td>
<td>2.54(-0.59,5.667614)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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</table>
### TABLE 127: PICO 6 PART 6- OTHER TREATMENTS: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High</td>
<td>Complications (general)(Pain or paraesthesia complaints)</td>
<td>NA</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm2, pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>3.3(2.80)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>34</td>
<td>2(1.90)</td>
<td>Mean Difference</td>
<td>1.3(0.16,2.437416)</td>
<td>Sham ultrasound (No ultrasound) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Complications (general)(Pain or paraesthesia complaints)</td>
<td>1.6 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>2.14(3.03)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>34</td>
<td>0.17(2.20)</td>
<td>Mean Difference</td>
<td>-1.97(-3.23,-0.71)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
</tr>
</tbody>
</table>

(P-value<.05)
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Complications (general)(Pain or paraesthesia complaints)</td>
<td>7.9 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>-2.76(3.06)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>34</td>
<td>-0.08(2.92)</td>
<td>Mean Difference</td>
<td>-2.68(-4.10,-1.26)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(SSS)</td>
<td>1.8 months</td>
<td>Sham ultrasound (w/splinting) (Sham ultrasound+splinting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>2.08(0.82)</td>
<td>Ketoprofen phonophoresis (w/splinting) (Ketoprofen phonophoresis (w/splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>1.63(0.73)</td>
<td>Mean Difference</td>
<td>0.45(-0.07,0.971890)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(SSS)</td>
<td>1.8 months</td>
<td>Ultrasound (w/splinting) (Ultrasound+splinting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>1.97(0.65)</td>
<td>Ketoprofen phonophoresis (w/splinting) (Ketoprofen phonophoresis (w/splinting). Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>1.63(0.73)</td>
<td>Mean Difference</td>
<td>0.34(-0.12,0.804648)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</tbody>
</table>
### TABLE 128: PICO 6 PART 6- OTHER TREATMENTS: FUNCTION

<table>
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<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Groupe1 N</th>
<th>Mean1/ P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Groupe2 N</th>
<th>Mean2/ P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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</thead>
<tbody>
<tr>
<td>Bakhtiary, A. H., 2004</td>
<td>High Quality</td>
<td>Grip strength(Units not reported)</td>
<td>1.6 months</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm2, pulse 1:4, 15 min/session))</td>
<td>.</td>
<td>. %</td>
<td>Laser (15 daily treatment sessions (5 sessions/week).)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm2, pulse 1:4, 15 min/session)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Bakhtiary, A. H., 2004</td>
<td>High Quality</td>
<td>NCS(Index SAP amplitude (?A))</td>
<td>1.6 months</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm2, pulse 1:4, 15 min/session))</td>
<td>.</td>
<td>. %</td>
<td>Laser (15 daily treatment sessions (5 sessions/week).)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm2, pulse 1:4, 15 min/session)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Bakhtiary, A. H., 2004</td>
<td>High Quality</td>
<td>NCS(Thumb SAP amplitude (?A))</td>
<td>1.6 months</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm2, pulse 1:4, 15 min/session))</td>
<td>.</td>
<td>. %</td>
<td>Laser (15 daily treatment sessions (5 sessions/week).)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm2, pulse 1:4, 15 min/session)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Bakhtiary, A. H., 2004</td>
<td>High Quality</td>
<td>NCS (CMAP)(Compound muscle action potential (mV))</td>
<td>1.6 months</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm2, pulse 1:4, 15 min/session))</td>
<td>.</td>
<td>. %</td>
<td>Laser (15 daily treatment sessions (5 sessions/week).)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Bakhtiary, A. H., 2004</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (ms))</td>
<td>1.6 months</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm², pulse 1:4, 15 min/session))</td>
<td>.</td>
<td>. %</td>
<td>Laser (15 daily treatment sessions (5 sessions/week).)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm², pulse 1:4, 15 min/session)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Bakhtiary, A. H., 2004</td>
<td>High Quality</td>
<td>NCS (DSL) (Antidromic index sensory latency (ms))</td>
<td>1.6 months</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm², pulse 1:4, 15 min/session))</td>
<td>.</td>
<td>. %</td>
<td>Laser (15 daily treatment sessions (5 sessions/week).)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm², pulse 1:4, 15 min/session)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Bakhtiary, A. H., 2004</td>
<td>High Quality</td>
<td>NCS (DSL) (Antidromic thumb sensory latency (ms))</td>
<td>1.6 months</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm², pulse 1:4, 15 min/session))</td>
<td>.</td>
<td>. %</td>
<td>Laser (15 daily treatment sessions (5 sessions/week).)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm², pulse 1:4, 15 min/session)) (P-value&lt;.05)</td>
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<tr>
<td>Bakhtiary, A. H., 2004</td>
<td>High Quality</td>
<td>Pinch Strength (Units not reported)</td>
<td>1.6 months</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm², pulse 1:4, 15 min/session))</td>
<td>.</td>
<td>. %</td>
<td>Laser (15 daily treatment sessions (5 sessions/week).)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm², pulse 1:4, 15 min/session)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Chang, W.D., 2008</td>
<td>High Quality</td>
<td>Grip strength (Digital prehension (kilograms))</td>
<td>1 month</td>
<td>Laser (Laser treatment)</td>
<td>20</td>
<td>5.2(0.83)</td>
<td>Placebo (Sham laser (placebo))</td>
<td>20</td>
<td>4.43(1.0 6)</td>
<td>Mean Difference</td>
<td>0.77(0.18,1.360 038)</td>
<td>Laser (Laser treatment) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Grou p1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Grou p2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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<tr>
<td>Chang,W.D., 2008</td>
<td>High</td>
<td>Grip strength(Kilograms)</td>
<td>1 month</td>
<td>Laser (Laser treatment)</td>
<td>20</td>
<td>21.19(4.12)</td>
<td>Placebo (Sham laser (placebo))</td>
<td>20</td>
<td>17.38(3.56)</td>
<td>Mean Difference</td>
<td>3.81(1.42,2.196375)</td>
<td>Laser (Laser treatment) (P-value&lt;.05)</td>
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<tr>
<td>Chang,W.D., 2008</td>
<td>High</td>
<td>Grip strength(Kilograms (lateral prehension))</td>
<td>1 month</td>
<td>Laser (Laser treatment)</td>
<td>20</td>
<td>5.33(1.33)</td>
<td>Placebo (Sham laser (placebo))</td>
<td>20</td>
<td>4.35(1.09)</td>
<td>Mean Difference</td>
<td>0.98(0.23,1.733644)</td>
<td>Laser (Laser treatment) (P-value&lt;.05)</td>
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<tr>
<td>Chang,W.D., 2008</td>
<td>High</td>
<td>NCS(Sensory peak latency of the median n. (ms))</td>
<td>1 month</td>
<td>Laser (Laser treatment)</td>
<td>20</td>
<td>3.67(0.21)</td>
<td>Placebo (Sham laser (placebo))</td>
<td>20</td>
<td>3.8(0.11)</td>
<td>Mean Difference</td>
<td>-0.13(-0.23,-0.02610)</td>
<td>Laser (Laser treatment) (P-value&lt;.05)</td>
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<tr>
<td>Chang,W.D., 2008</td>
<td>High</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>1 month</td>
<td>Laser (Laser treatment)</td>
<td>20</td>
<td>3.87(0.30)</td>
<td>Placebo (Sham laser (placebo))</td>
<td>20</td>
<td>4.1(0.21)</td>
<td>Mean Difference</td>
<td>-0.23(-0.39,-0.06950)</td>
<td>Laser (Laser treatment) (P-value&lt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High</td>
<td>Questionnaire (General/undefined)(Functional Status Scale)</td>
<td>1 month</td>
<td>Laser (Laser treatment)</td>
<td>20</td>
<td>11.04(0.43)</td>
<td>Placebo (Sham laser (placebo))</td>
<td>20</td>
<td>19.6(1.02)</td>
<td>Mean Difference</td>
<td>-8.56(-9.05,-8.07486)</td>
<td>Laser (Laser treatment) (P-value&lt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High</td>
<td>NCS (CMAP)(Compound muscle action potential (mV))</td>
<td>1.4 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>5.1(2.60)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
<td>19</td>
<td>5.6(2.70)</td>
<td>Mean Difference</td>
<td>-0.5(-2.19,1.185456)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High</td>
<td>NCS (CMAP)(Compound muscle action potential (mV))</td>
<td>4.1 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>4.8(2.10)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
<td>19</td>
<td>4.3(0.70)</td>
<td>Mean Difference</td>
<td>0.5(-0.50,1.495353)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High</td>
<td>NCS (CMAP)(Compound muscle action potential (mV))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>5.9(1.90)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>5.1(2.60)</td>
<td>Mean Difference</td>
<td>0.8(-0.64,2.235343)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Colbert,A.P., 2010</td>
<td>High</td>
<td>NCS (CMAP)(Compound muscle action potential (mV))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>5.9(1.90)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
<td>19</td>
<td>5.6(2.70)</td>
<td>Mean Difference</td>
<td>0.3(-1.17,1.772199)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group p1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group p2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (CMAP)(Compound muscle action potential (mV))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>5.9(3.00)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>19</td>
<td>4.3(0.70)</td>
<td>Mean Difference</td>
<td>1.6(0.25,2.951958)</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT)) (P-value&lt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (CMAP)(Compound muscle action potential (mV))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>5.9(3.00)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>19</td>
<td>4.8(2.10)</td>
<td>Mean Difference</td>
<td>1.1(-0.52,2.718757)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>1.4 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>19</td>
<td>5.1(1.60)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>19</td>
<td>5.0(0.80)</td>
<td>Mean Difference</td>
<td>0.1(-0.70,0.904367)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>4.1 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>19</td>
<td>5.2(1.00)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>19</td>
<td>5.2(2.40)</td>
<td>Mean Difference</td>
<td>0(-1.17,1.169102)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>5(1.30)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>19</td>
<td>5.1(1.60)</td>
<td>Mean Difference</td>
<td>-0.1(-1.02,0.817725)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>5(1.30)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>19</td>
<td>5(0.80)</td>
<td>Mean Difference</td>
<td>0(-0.67,0.673807)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>5.1(1.30)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>19</td>
<td>5.2(1.00)</td>
<td>Mean Difference</td>
<td>-0.1(-0.83,0.625813)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>5.1(1.30)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>19</td>
<td>5.2(2.40)</td>
<td>Mean Difference</td>
<td>-0.1(-1.32,1.120338)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group p1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group p2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>1.4 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>4.2(0.50)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
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<td>4.7(1.00)</td>
<td>Mean Difference</td>
<td>-0.5(-1.00,0.002729)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>4.1 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>4.3(0.70)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
<td>19</td>
<td>4.8(1.20)</td>
<td>Mean Difference</td>
<td>-0.5(-1.12,0.124680)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
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<td>4.2(0.90)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
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<td>4.2(0.50)</td>
<td>Mean Difference</td>
<td>0(-0.45,0.454017)</td>
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<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
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<td>4.2(0.90)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
<td>19</td>
<td>4.7(1.00)</td>
<td>Mean Difference</td>
<td>-0.5(-1.10,0.098142)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>4.3(0.90)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>4.3(0.70)</td>
<td>Mean Difference</td>
<td>0(-0.50,0.504636)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>4.3(0.90)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
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<td>4.8(1.20)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential (uV))</td>
<td>1.4 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>18.5(8.30)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
<td>19</td>
<td>16(8.80)</td>
<td>Mean Difference</td>
<td>2.5(-2.94,7.939336)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential (uV))</td>
<td>4.1 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>16.9(6.30)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
<td>19</td>
<td>16.2(10.30)</td>
<td>Mean Difference</td>
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<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential (uV))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>18.2(7.70)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
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<td>16(8.80)</td>
<td>Mean Difference</td>
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<td>Reference Title</td>
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<td>Group p2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential (uV))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>18.2(7.70)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>18.5(8.30)</td>
<td>Mean Difference</td>
<td>-0.3(-5.33,4.731625)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
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<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>18.3(7.90)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
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<td>16.2(10.30)</td>
<td>Mean Difference</td>
<td>2.1(-3.68,7.882559)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
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<td>18.3(7.90)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
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<td>16.9(6.30)</td>
<td>Mean Difference</td>
<td>1.4(-3.07,5.873545)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale))</td>
<td>1.4 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>1.7(0.50)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
<td>19</td>
<td>1.8(0.60)</td>
<td>Mean Difference</td>
<td>-0.1(-0.45,0.251191)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale))</td>
<td>4.1 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>1.9(0.80)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
<td>19</td>
<td>2(0.80)</td>
<td>Mean Difference</td>
<td>-0.1(-0.61,0.408726)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>1.7(0.40)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT))</td>
<td>19</td>
<td>1.7(0.50)</td>
<td>Mean Difference</td>
<td>0(-0.29,0.285096)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>1.7(0.40)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT))</td>
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<td>1.8(0.60)</td>
<td>Mean Difference</td>
<td>-0.1(-0.42,0.221746)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Colbert, A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>Mean Difference</td>
<td>-0.1(-0.55,0.345589)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Colbert, A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>Mean Difference</td>
<td>-0.2(-0.65,0.245589)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>NA</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm2, pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>Mean Difference</td>
<td>-4(-8.97,0.972218)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Treatment 2 (Details)</td>
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<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>1.6 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>Mean Difference</td>
<td>3.96 (1.32, 6.60)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value &lt; .05)</td>
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<td>Effect Measure</td>
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<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>7.9 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td></td>
<td>7.43 (4.16, 10.70)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
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<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>NA</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>5.2(1.00)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>34</td>
<td>5.2(1.20)</td>
<td>Mean Difference</td>
<td>0(-0.53,0.525063)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Treatment 1 (Details)</td>
<td>Grou p1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Grou p2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>1.6 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm2, pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>N/A</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>34</td>
<td>0.06(0.45)</td>
<td>Mean Difference</td>
<td>-0.61(-0.83,-0.39)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm2, pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
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<td>Reference Title</td>
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<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>7.9 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm2, pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>Mean Difference</td>
<td>-0.35(-0.55,-0.15)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm2, pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
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<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High</td>
<td>NCS (SNCV)(Sensory nerve conduction velocity (antidromic))</td>
<td>NA</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>Mean Difference</td>
<td>-2.1(-5.52,1.322662)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>
**Reference**

Ebenbichler, G.R., 1998

**Quality**
High Quality

**Outcome Details**
NCS (SNCV) (Sensory nerve conduction velocity (antidromic))

**Treatment Details**

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<th>Reference Title</th>
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<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Treatment 2 (Details)</th>
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<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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<tbody>
<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>NCS (SNCV) (Sensory nerve conduction velocity (antidromic))</td>
<td>1.6 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>Mean Difference</td>
<td>8.24 (7.81, 8.67)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value &lt; .05)</td>
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**Mean1/ P1 (SD1)**
34 7.35 (1.0 7)

**Mean2/ P2 (SD2)**
34 - 0.89 (0.6 8)
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<th>Reference Title</th>
<th>Quality</th>
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<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group p1 N</th>
<th>Mean1/ P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group p2 N</th>
<th>Mean2/ P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>NCS (SNCV)(Sensory nerve conduction velocity (antidromic))</td>
<td>7.9 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm2, pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>2.69(0.89)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>34</td>
<td>-0.27(0.71)</td>
<td>Mean Difference</td>
<td>2.96(2.58,3.34)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm2, pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Grou p1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Grou p2 N</td>
<td>Mean2/ P2 (SD2)</td>
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<td>Result (95% CI)</td>
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<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Pinch Strength(Kilograms)</td>
<td>NA</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>5.5(1.80)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>34</td>
<td>5.8(1.80)</td>
<td>Mean Difference</td>
<td>-0.3(-1.16,0.555665)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>1.6 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>Mean Difference</td>
<td>0.27(-0.09,0.63)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
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<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>7.9 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>Mean Difference</td>
<td>0.71 (0.45, 0.97)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value &lt; .05)</td>
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<p>|    | Group1 N | Mean1/ P1 (SD1) | Group2 N | Mean2/ P2 (SD2) |    |    |    |    |</p>
<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Grou p1 N</th>
<th>Mean1/ P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Grou p2 N</th>
<th>Mean2/ P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>1 month</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
<td>41</td>
<td>22.4(6.7 0)</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
<td>40</td>
<td>19.7(6.5 0)</td>
<td>Mean Difference</td>
<td>2.7(- 0.175,5.74677)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
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<td>Laser (Low-level laser therapy (LLLT))</td>
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<td>22.8(6.9 0)</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
<td>40</td>
<td>19.6(7.3 0)</td>
<td>Mean Difference</td>
<td>3.2(0.11,6.2949 81)</td>
<td>Laser (Low-level laser therapy (LLLT)) (P-value&lt;.05)</td>
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<tr>
<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>NCS(Motor nerve velocity, (m/sn))</td>
<td>3 months</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
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<td>52(6.20)</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
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<td>50.3(6.3 0)</td>
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<td>1.7(- 1.024,4.22785)</td>
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<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>3 months</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
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<td>4.1(0.70)</td>
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<td>Evcik,D., 2007</td>
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<td>NCS (DSL)(Sensory distal latency, (msn))</td>
<td>3 months</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
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<td>3(0.50)</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
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<td>3.1(0.60)</td>
<td>Mean Difference</td>
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<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>NCS (MA)(Motor amplitude (uV))</td>
<td>3 months</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
<td>41</td>
<td>6.9(3.40)</td>
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<td>7.2(4.00)</td>
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<td>-0.3(- 1.92,1.318574)</td>
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<td>27.9(13. 40)</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>NCS (SNCV)(Sensory nerve velocity, (m/sn))</td>
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<td>Laser (Low-level laser therapy (LLLT))</td>
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<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>1 month</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
<td>Mean Difference</td>
<td>0.6(-0.05,1.253383)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Evcik,D., 2007</td>
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<td>Pinch Strength (Kilograms)</td>
<td>2.8 months</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
<td>Mean Difference</td>
<td>0.9(0.22,1.575244)</td>
<td>Laser (Low-level laser therapy (LLLT)) (P-value&lt;.05)</td>
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<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Grip strength (Units not reported)</td>
<td>1.2 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>-0.6(-1.00,-0.19857)</td>
<td>Placebo+splint (Placebo+splint (multiple treatments)) (P-value&lt;.05)</td>
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<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Grip strength (Units not reported)</td>
<td>2.8 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>0.89(0.49,1.289153)</td>
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<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>NCS (CMAP) (Compound muscle action potential (mV))</td>
<td>2.8 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>0.01(-0.12,0.143808)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>NCS (DML) (Distal motor latency (ms))</td>
<td>2.8 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>-1.9(-2.19,-1.60988)</td>
<td>Laser+splint (LLLT+splint (multiple treatments)) (P-value&lt;.05)</td>
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<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>NCS (DSL) (Distal sensory latency (ms))</td>
<td>2.8 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>-0.18(-0.24,-0.12184)</td>
<td>Laser+splint (LLLT+splint (multiple treatments)) (P-value&lt;.05)</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>NCS (SNAP) (Sensory nerve action potential amplitude)</td>
<td>2.8 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>1.09(0.44,1.740 084)</td>
<td>Laser+splint (LLLT+splint (multiple treatments)) (P-value&lt;.05)</td>
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<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Pinch Strength (Units not reported)</td>
<td>1.2 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>3.35(2.41,4.285 725)</td>
<td>Laser+splint (LLLT+splint (multiple treatments)) (P-value&lt;.05)</td>
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<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Pinch Strength (Units not reported)</td>
<td>2.8 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>-0.07(-0.18,0.039410)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>1.2 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>0.21(-0.02,0.439651)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>2.8 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>0.16(-0.04,0.356873)</td>
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<tr>
<td>Saeed,F.-U., 2012</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (ms))</td>
<td>1 month</td>
<td>Ultrasound (Ultrasound therapy)</td>
<td>Laser (Laser therapy)</td>
<td>Mean Difference</td>
<td>0.62(0.55,0.693 231)</td>
<td>Laser (Laser therapy) (P-value&lt;.05)</td>
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<td>Saeed,F.-U., 2012</td>
<td>High Quality</td>
<td>NCS (DSL) (Distal sensory latency (ms))</td>
<td>1 month</td>
<td>Ultrasound (Ultrasound therapy)</td>
<td>Laser (Laser therapy)</td>
<td>Mean Difference</td>
<td>0.47(0.39,0.550 000)</td>
<td>Laser (Laser therapy) (P-value&lt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
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<td>Treatment 1 (Details)</td>
<td>Grou p1 N</td>
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<td>Treatment 2 (Details)</td>
<td>Grou p2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Saeed,F.-U., 2012</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(No mention of Boston scale, rather merely &quot;functional status scale&quot;)</td>
<td>1 month</td>
<td>Ultrasound (Ultrasound therapy)</td>
<td>50</td>
<td>-0.4(0.17)</td>
<td>Laser (Laser therapy)</td>
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<td>-0.75(0.12)</td>
<td>Mean Difference</td>
<td>0.35(0.29,0.407,678)</td>
<td>Laser (Laser therapy) (P-value&lt;.05)</td>
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<tr>
<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>NCS (CMAP)(Compound muscle action potential (mV))</td>
<td>1 month</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>7.2(2.70)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>39</td>
<td>7.6(2.80)</td>
<td>Mean Difference</td>
<td>-0.4(-1.63,0.828511)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>NCS (CMAP)(Compound muscle action potential (mV))</td>
<td>1.1 years</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>7.8(2.50)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
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<td>8(3.60)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>1 month</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>4(0.70)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>39</td>
<td>4.7(1.00)</td>
<td>Mean Difference</td>
<td>-0.7(-1.08,-0.31524)</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1)) (P-value&lt;.05)</td>
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<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>1.1 years</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>4.2(0.80)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
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<td>5.5(1.80)</td>
<td>Mean Difference</td>
<td>-1.3(-1.92,-0.68044)</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1)) (P-value&lt;.05)</td>
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<td>Outcome Details</td>
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<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Yang.C.P., 2011</td>
<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>1 month</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>3.3(0.70)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
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<td>3(0.60)</td>
<td>Mean Difference</td>
<td>0.3(0.01,0.591543)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2)) (P-value&lt;.05)</td>
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<td>Yang.C.P., 2011</td>
<td>High Quality</td>
<td>NCS (DSL)(Distal sensory latency (ms))</td>
<td>1.1 years</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>3.4(0.60)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>39</td>
<td>3.7(1.10)</td>
<td>Mean Difference</td>
<td>-0.3(-0.69,0.094439)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Yang.C.P., 2011</td>
<td>High Quality</td>
<td>NCS (MCV)(Motor nerve conduction velocity (ms))</td>
<td>1 month</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>53.7(3.80)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>39</td>
<td>52.4(3.60)</td>
<td>Mean Difference</td>
<td>1.3(-0.35,2.954207)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Yang.C.P., 2011</td>
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<td>NCS (MCV)(Motor nerve conduction velocity (ms))</td>
<td>1.1 years</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>52.7(4.00)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>39</td>
<td>49.7(4.60)</td>
<td>Mean Difference</td>
<td>3(1.08,4.924014)</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1)) (P-value&lt;.05)</td>
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<tr>
<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential amplitude)</td>
<td>1 month</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>Mean Difference</td>
<td>-2.4(-6.80,2.000383)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>NCS (SNAP)(Sensory nerve action potential amplitude)</td>
<td>1.1 years</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>Mean Difference</td>
<td>-0.3(-4.70,4.104284)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
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</tr>
<tr>
<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>NCS (SNCV)(Sensory nerve conduction velocity (prolonged antidromic wrist palm))</td>
<td>1 month</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>Mean Difference</td>
<td>-4.7(-7.90,-1.49742)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2)) (P-value&lt;.05)</td>
<td></td>
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</tr>
<tr>
<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>NCS (SNCV)(Sensory nerve conduction velocity (prolonged antidromic wrist palm))</td>
<td>1.1 years</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>Mean Difference</td>
<td>-0.9(-4.42,2.622683)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>NCS (DML)(Median motor distal latency)</td>
<td>1.8 months</td>
<td>Ultrasound (w/splinting) (Ultrasound+splinting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>4.43(0.55)</td>
<td>Sham ultrasound (w/splinting) (Sham ultrasound+splinting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>4.32(0.60)</td>
<td>Mean Difference</td>
<td>0.11(-0.28,0.496923)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>NCS (DSL)(Median sensory distal latency)</td>
<td>1.8 months</td>
<td>Ultrasound (w/splinting) (Ultrasound+splinting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>3.87(0.29)</td>
<td>Sham ultrasound (w/splinting) (Sham ultrasound+splinting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>3.94(0.47)</td>
<td>Mean Difference</td>
<td>-0.07(-0.33,0.192531)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined)(FSS)</td>
<td>1.8 months</td>
<td>Ultrasound (w/splinting) (Ultrasound+splinting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>1.98(0.78)</td>
<td>Sham ultrasound (w/splinting) (Sham ultrasound+splinting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>2.19(0.89)</td>
<td>Mean Difference</td>
<td>-0.21(-0.77,0.352565)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Chang,W.D., 2008</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(VAS pain)</td>
<td>1 month</td>
<td>Laser (Laser treatment)</td>
<td>20</td>
<td>. %</td>
<td>Placebo (Sham laser (placebo))</td>
<td>20</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Laser (Laser treatment) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Bakhtiyari,A.H., 2004</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)</td>
<td>1.6 months</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm2, pulse 1:4, 15 min/session))</td>
<td>.</td>
<td>. %</td>
<td>Laser (15 daily treatment sessions (5 sessions/week).)</td>
<td>.</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Ultrasound (Ultrasound treatment (1 MHz, 1.0 W/cm2, pulse 1:4, 15 min/session)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(VAS pain (day): 0-10 scale)</td>
<td>1 month</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
<td>41</td>
<td>3(0.98)</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
<td>40</td>
<td>3(1.61)</td>
<td>Mean Difference</td>
<td>0(-0.58,0.58)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(VAS pain (night): 0-10 scale)</td>
<td>1 month</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
<td>41</td>
<td>3.8(1.63)</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
<td>40</td>
<td>3.5(2.26)</td>
<td>Mean Difference</td>
<td>0.3(-0.56,1.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(VAS pain (day): 0-10 scale)</td>
<td>2.8 months</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
<td>41</td>
<td>2.2(0.98)</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
<td>40</td>
<td>2.8(2.58)</td>
<td>Mean Difference</td>
<td>-0.6(-1.45,0.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Evcik,D., 2007</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(VAS pain (night): 0-10 scale)</td>
<td>2.8 months</td>
<td>Laser (Low-level laser therapy (LLLT))</td>
<td>41</td>
<td>2.7(1.96)</td>
<td>Laser (sham) (No laser therapy (placebo))</td>
<td>40</td>
<td>2.9(2.58)</td>
<td>Mean Difference</td>
<td>-0.2(-1.20,0.80)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>1.2 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>Placebo+splint (Placebo+splint (multiple treatments)) (P-value&lt;.05)</td>
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<tr>
<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>2.8 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>Mean Difference</td>
<td>Placebo+splint (Placebo+splint (multiple treatments)) (P-value&lt;.05)</td>
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<tr>
<td>Saeed,F.-U., 2012</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>1 month</td>
<td>Ultrasound (Ultrasound therapy)</td>
<td>Laser (Laser therapy)</td>
<td>Mean Difference</td>
<td>Laser (Laser therapy) (P-value&lt;.05)</td>
<td></td>
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<tr>
<td>Weintraub,M.I., 2008</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (NPS 10. Neuropathic pain scale (NPS))</td>
<td>2 months</td>
<td>No magnet (sham) (Sham (no magnet therapy))</td>
<td>Magnet (Magnet therapy)</td>
<td>Mean Difference</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
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<tr>
<td>Weintraub,M.I., 2008</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (NPS 4. Neuropathic pain scale (NPS))</td>
<td>2 months</td>
<td>No magnet (sham) (Sham (no magnet therapy))</td>
<td>Magnet (Magnet therapy)</td>
<td>Mean Difference</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
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<tr>
<td>Weintraub,M.I., 2008</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (NPS 8. Neuropathic pain scale (NPS))</td>
<td>2 months</td>
<td>No magnet (sham) (Sham (no magnet therapy))</td>
<td>Magnet (Magnet therapy)</td>
<td>Mean Difference</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Weintraub,M., I., 2008</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (NPS NA. Neuropathic pain scale (NPS))</td>
<td>2 months</td>
<td>No magnet (sham) (Sham (no magnet therapy))</td>
<td>10</td>
<td>38.75(14.3 1)</td>
<td>Magnet (Magnet therapy)</td>
<td>11</td>
<td>36.25(20.4 8)</td>
<td>Mean Difference</td>
<td>2.5(-12.50,17.50490)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Weintraub,M., I., 2008</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)</td>
<td>2 months</td>
<td>No magnet (sham) (Sham (no magnet therapy))</td>
<td>10</td>
<td>3.78(2.27)</td>
<td>Magnet (Magnet therapy)</td>
<td>11</td>
<td>4.15(2.13)</td>
<td>Mean Difference</td>
<td>-0.37(-2.26,1.517852)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)</td>
<td>1.8 months</td>
<td>Ultrasound (w/ splinting) (Ultrasound+splinting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>2.77(2.74)</td>
<td>Sham ultrasound (w/ splinting) (Sham ultrasound+splinting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>3.28(2.74)</td>
<td>Mean Difference</td>
<td>-0.51(-2.35,1.332032)</td>
<td>Not Significant (P-value&gt;.05)</td>
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</tbody>
</table>
**TABLE 130: PICO 6 PART 6- OTHER TREATMENTS: QUALITY OF LIFE**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weintraub, M.I., 2008</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-patient satisfaction)(Sleep interference)</td>
<td>2 months</td>
<td>No magnet (sham) (Sham (no magnet therapy))</td>
<td>10</td>
<td>1.1(1.37)</td>
<td>Magnet (Magnet therapy)</td>
<td>11</td>
<td>3.29(2.48)</td>
<td>Mean Difference</td>
<td>-2.19(-3.88,-0.49619)</td>
<td>No magnet (sham) (Sham (no magnet therapy)) (P-value&lt;.05)</td>
</tr>
</tbody>
</table>
### TABLE 131: PICO 6 PART 6- OTHER TREATMENTS: SYMPTOMS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/ P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/ P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favorited Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chang,W.D., 2008</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (Symptom Severity Scale)</td>
<td>1 month</td>
<td>Laser (Laser treatment)</td>
<td>20</td>
<td>19.35(0.63)</td>
<td>Placebo (Sham laser (placebo))</td>
<td>20</td>
<td>28.71(0.85)</td>
<td>Mean Difference</td>
<td>-9.36(-9.82,-8.89630)</td>
<td>Laser (Laser treatment) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>1.4 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>19</td>
<td>2.1(0.70)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>19</td>
<td>2.2(0.50)</td>
<td>Mean Difference</td>
<td>-0.1(-0.49,0.286807)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>4.1 months</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>19</td>
<td>2.4(0.80)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>19</td>
<td>2.3(0.80)</td>
<td>Mean Difference</td>
<td>0.1(-0.41,0.608726)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>2(0.80)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>19</td>
<td>2.1(0.70)</td>
<td>Mean Difference</td>
<td>-0.1(-0.57,0.371173)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>1.4 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>2(0.80)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>19</td>
<td>2.2(0.50)</td>
<td>Mean Difference</td>
<td>-0.2(-0.62,0.216507)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Colbert,A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>2.3(0.70)</td>
<td>Magnet therapy (45mT) (Magnet therapy (45mT)-)</td>
<td>19</td>
<td>2.3(0.80)</td>
<td>Mean Difference</td>
<td>0(-0.47,0.472779)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
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<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
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<tr>
<td>Colbert, A.P., 2010</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS) (Boston CTS Questionnaire (symptom severity scale))</td>
<td>4.1 months</td>
<td>Sham magnet therapy (No magnet therapy (sham 0mT))</td>
<td>20</td>
<td>2.3(0.70)</td>
<td>Magnet therapy (15mT) (Magnet therapy (15mT)-)</td>
<td>19</td>
<td>2.4(0.80)</td>
<td>Mean Difference</td>
<td>-0.1(-0.58, 0.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (Not questionnaire, worst complaint (cm))</td>
<td>NA</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm2, pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>6.5(2.60)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>34</td>
<td>5.8(2.80)</td>
<td>Mean Difference</td>
<td>0.7(-0.58, 1.98)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
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<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality (General/undefined) (Not questionnaire, worst complaint (cm))</td>
<td>1.6 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>3.91(3.45)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>34</td>
<td>1.56(3.03)</td>
<td>Mean Difference</td>
<td>-2.35(-3.89, -0.81)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (Not questionnaire, worst complaint (cm))</td>
<td>7.9 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>-4.78(3.21)</td>
<td>Sham ultrasound (No ultrasound)</td>
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<td>-0.95(4.43)</td>
<td>Mean Difference</td>
<td>-3.83(-5.67,-1.99)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
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<td>Treatment 2 (Details)</td>
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<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Sensory loss( )</td>
<td>NA</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>2.4(2.40)</td>
<td>Sham ultrasound (No ultrasound)</td>
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<td>2(2.40)</td>
<td>Mean Difference</td>
<td>0.4(-0.74,1.540887)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Sensory loss( )</td>
<td>1.6 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>34</td>
<td>-1.14(2.53)</td>
<td>Sham ultrasound (No ultrasound)</td>
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<td>-0.07(2.35)</td>
<td>Mean Difference</td>
<td>-1.07(-2.23,0.09)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Ebenbichler, G.R., 1998</td>
<td>High Quality</td>
<td>Sensory loss( )</td>
<td>7.9 months</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.)</td>
<td>Sham ultrasound (No ultrasound)</td>
<td>Mean Difference</td>
<td>-1.52(-2.79,-0.25)</td>
<td>Ultrasound (20 sessions of ultrasound (active) treatment (1 MHz, 1.0 W/cm², pulsed mode 1:4, 15 minutes per session) applied to the area over the carpal tunnel of one wrist, and indistinguishable sham ultrasound treatment applied to the other. The first 10 treatments were performed daily (5 sessions/week); 10 further treatments were twice weekly for 5 weeks.) (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Effect Measure</td>
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<tr>
<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)/(Boston CTS Questionnaire (symptom severity scale))</td>
<td>1.2 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>56</td>
<td>1.68(0.6 6)</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>56</td>
<td>1.43(0.4 9)</td>
<td>Mean Difference</td>
<td>0.25(0.03,0.465 297)</td>
<td>Placebo+splint (Placebo+splint (multiple treatments)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Fusakul,Y., 2014</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)/(Boston CTS Questionnaire (symptom severity scale))</td>
<td>2.8 months</td>
<td>Laser+splint (LLLT+splint (multiple treatments))</td>
<td>56</td>
<td>1.49(0.5 8)</td>
<td>Placebo+splint (Placebo+splint (multiple treatments))</td>
<td>56</td>
<td>1.35(0.5 1)</td>
<td>Mean Difference</td>
<td>0.14(- 0.06,0.342286)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Saeed,F.-U., 2012</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (No mention of Boston scale, rather merely &quot;symptom severity scale&quot;)</td>
<td>1 month</td>
<td>Ultrasound (Ultrasound therapy)</td>
<td>50</td>
<td>- 0.44(0.1 8)</td>
<td>Laser (Laser therapy)</td>
<td>50</td>
<td>- 0.87(0.1 8)</td>
<td>Mean Difference</td>
<td>0.43(0.36,0.500 56)</td>
<td>Laser (Laser therapy) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS)/(Global symptom score (GSS))</td>
<td>1 month</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>4.4(3.10)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>39</td>
<td>5(3.70)</td>
<td>Mean Difference</td>
<td>-0.6(- 2.12,0.923161)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS)/(Global symptom score (GSS))</td>
<td>6.9 months</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>3.4(5.80)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>39</td>
<td>7.2(5.40)</td>
<td>Mean Difference</td>
<td>-3.8(-6.30, -1.29537)</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/ P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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</tr>
<tr>
<td>Yang,C.P., 2011</td>
<td>High Quality</td>
<td>Questionnaire/Scale (GSS)(Global symptom score (GSS))</td>
<td>1.1 years</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1))</td>
<td>38</td>
<td>4.5(7.70)</td>
<td>Steroid (2 weeks of prednisolone 20 mg daily followed by 2 weeks of prednisolone 10 mg daily (Group 2))</td>
<td>39</td>
<td>11(8.60)</td>
<td>Mean Difference</td>
<td>-6.5(-10.14,-2.85)</td>
<td>Acupuncture (Acupuncture administered in 8 sessions over 4 weeks (Group 1)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Yildiz,N., 2011</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (SSS)</td>
<td>1.8 months</td>
<td>Ultrasound (w/ splinting) (Ultrasound+splitting. Included the intention-intention-to-treat analysis data (Group 2))</td>
<td>17</td>
<td>1.97(0.65)</td>
<td>Sham ultrasound (w/ splinting) (Sham ultrasound+splitting. Included the intention-intention-to-treat analysis data)</td>
<td>17</td>
<td>2.08(0.82)</td>
<td>Mean Difference</td>
<td>-0.11(-0.61,0.38)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
META-ANALYSES

FIGURE 11: PICO 6 PART 1 IMMOBILIZATION VERSUS NO IMMOBILIZATION: NCS DML-FUNCTION

<table>
<thead>
<tr>
<th>Study</th>
<th>WMD (95% CI)</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Madjdinasab, N., 2008</td>
<td>0.29 (-0.34, 0.92)</td>
<td>10.69</td>
</tr>
<tr>
<td>Manente, G., 2001</td>
<td>-0.02 (-0.49, 0.45)</td>
<td>18.87</td>
</tr>
<tr>
<td>Soyupek, F., 2012</td>
<td>-0.11 (-0.57, 0.35)</td>
<td>20.04</td>
</tr>
<tr>
<td>Yagci, I., 2009</td>
<td>-0.14 (-0.43, 0.15)</td>
<td>50.40</td>
</tr>
<tr>
<td>Overall (I-squared = 0.0%, p = 0.670)</td>
<td>-0.07 (-0.27, 0.14)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

NOTE: Weights are from random effects analysis
FIGURE 12: PICO 6 PART 1 IMMOBILIZATION VERSUS NO IMMOBILIZATION: NCS SNCV

NOTE: Weights are from random effects analysis
Overall  (I-squared = 0.0%, p = 0.682)
Manente,G., 2001  -0.72 (-5.85, 4.41)  26.38
Yagci,I., 2009   0.32 (-3.18, 3.82)  56.77
Overall  (I-squared = 0.0%, p = 0.682)  -0.50 (-3.13, 2.13)  100.00

NOTE: Weights are from random effects analysis
SURGICAL RELEASE FOR CARPAL TUNNEL SYNDROME (CTS)
GUIDELINE RECOMMENDATIONS

A. SURGICAL RELEASE LOCATION

Strong evidence supports that surgical release of the transverse carpal ligament should relieve symptoms and improve function.

Strength of Recommendation: Strong Evidence

Description: Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.

Rationale


Risks and Harms of Implementing this Recommendation

The risks associated with implementing this recommendation are those of a small outpatient operative procedure.

B. SURGICAL RELEASE PROCEDURE

Limited evidence supports that if surgery is chosen, a practitioner might consider using endoscopic carpal tunnel release based on possible short term benefits.

Strength of Recommendation: Limited Evidence

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

Rationale

2007) examined long term outcomes for endoscopic release versus open release and did not find any advantage of one method over the other. Studies comparing “mini-open” to standard release were inconclusive.

**Risks and Harms of Implementing this Recommendation**
The risks associated with implementing this recommendation are those of a small outpatient operative procedure.

---

**C. SURGICAL PROCEDURES VERSUS NONOPERATIVE TREATMENTS**

Strong evidence supports that surgical treatment of carpal tunnel syndrome should have a greater treatment benefit at 6 and 12 months as compared to splinting, NSAIDs/therapy, and a single steroid injection.

**Strength of Recommendation: Strong Evidence ★★★★★**

Description: Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.

**Rationale**
Four high quality (Gerritsen 2002, Hui 2005, Ismatullah 2013, and Jarvik 2009) and 3 moderate quality (Andreu 2013, Ly 2005, and Ly-Pen 2012) studies compared the effectiveness of surgical treatment to non-operative treatment for the relief of CTS symptoms. All three studies showed that surgery was superior for the relief of daytime and nocturnal paresthesias and return of grip strength. Of these, one high quality (Gerritson 2002) and one moderate quality study (Andreu 2013) examined the long term outcomes for surgery versus conservative treatment and found better results with surgery.

**Risks and Harms of Implementing this Recommendation**
The risks associated with implementing this recommendation are those of a small outpatient operative procedure.

---

**Future Research for Surgical Release of Carpal Tunnel Syndrome**
Future research should focus on stratifying treatment outcomes based on preoperative symptom severity.
## STUDY QUALITY TABLE FOR SURGICAL TREATMENTS

### TABLE 132: INTERVENTION QUALITY EVALUATIONS

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
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## RESULTS

### SUMMARY OF DATA FINDINGS

**TABLE 133: SUMMARY OF FINDINGS PICO 7 PART 1 ENDOSCOPIC (EARLY FOLLOW-UP (3 MONTHS UP TO 1 YEAR))**

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<th>Outcomes</th>
<th>Favors treatment 1</th>
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CONT'D SUMMARY OF FINDINGS PICO 7 PART 1 ENDOSCOPIC (EARLY FOLLOW-UP (3 MONTHS UP TO 1 YEAR))

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<td>Symptoms</td>
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<tr>
<td>Paresthesia (VAS scale)</td>
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<td>Questionnaire (Levine-SSS)</td>
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<td>Score range from 0 (no pain or tenderness in scar or proximal palm and no activity limitation) to 100 (severe pain in scar or proximal palm and severe activity limitation because of pain or tenderness)</td>
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<td>90 days</td>
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<td>Score range; carpal tunnel syndrome, 1 (no symptoms or disability) to 5 (most severe symptoms or disability)</td>
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<td>Symptom recurrence (weakness)</td>
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<td>Symptom relief (general)</td>
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<td>&gt;75% improvement</td>
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521
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<td><strong>Function</strong></td>
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### TABLE 135: SUMMARY OF FINDINGS PICO 7 PART 2 MINI (EARLY FOLLOW-UP (3 MONTHS UP TO 1 YEAR))

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<td>Favors treatment 1</td>
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<td>Favors treatment 2</td>
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<tr>
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**Complications**

- Complications (general)
- Symptom occurrence (pillar pain)
- Symptom occurrence (scar length)
- Symptom occurrence (scar tenderness)

**Function**

- Grip Strength
- Percentage of contralateral hand
- Key pinch strength
- NCS (DML)
- NCS (EMG)
- NCS (SNCV)
- Phalen's test score
- Pinch Strength
- Pinch Strength (three-point pinch)
- Pinch Strength (two-point pinch)
- Questionnaire (Boston-FSS)
- Questionnaire (DASH-Quick DASH)
- Questionnaire (Levine-FSS)
- Range of motion
- Semmes-Weinstein Monofilaments Test (SW test)
- Tinel's Sign/Test
- Two-point discrimination

**Other**

- Patient satisfaction (general)
- Questionnaire/Scale (Vancouver scale)

**Pain**

- Questionnaire/Scale (VAS-pain)
- Symptom recurrence (general)
- Night pain
- Wrist pain

**Quality Of Life**

- Return to normal activities
- Return to work

**Symptoms**

- Paresthesia (VAS scale)
- Questionnaire (Boston-SSS)
- Questionnaire (Levine-SSS)
- Symptom recurrence (general weakness)
- Symptom recurrence (general stiffness)
- Symptom recurrence (numbness)
- Symptom relief (general)
### Table 136: Summary of Findings PICO 7 Part 2 Mini (Late Follow-up (> 1 Year))

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<tr>
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</tr>
<tr>
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<tr>
<td>Complications</td>
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<td></td>
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<tr>
<td>Symptom occurrence (scar pain)</td>
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<tr>
<td>Function</td>
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<tr>
<td>Questionnaire (Boston-FSS)</td>
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<tr>
<td>Boston CTS Questionnaire (functional status scale)-Italian modified version</td>
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<tr>
<td>570 days</td>
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<td></td>
<td></td>
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<tr>
<td>900 days</td>
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<tr>
<td>1800 days</td>
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<td></td>
</tr>
<tr>
<td>Questionnaire (DASH-Quick DASH)</td>
<td></td>
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<tr>
<td>Two-point discrimination</td>
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<td></td>
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<td>Other</td>
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<td>Patient satisfaction (general)</td>
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<td>Subjective satisfaction with their scar</td>
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<td>1800 days</td>
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<tr>
<td>Quality Of Life</td>
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<tr>
<td>Return to Work</td>
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<td>Symptoms</td>
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<tr>
<td>Questionnaire (Boston-SSS)</td>
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<tr>
<td>Boston CTS Questionnaire (symptom severity scale)-Italian modified version</td>
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<td>570 days</td>
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<td>900 days</td>
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<td>1800 days</td>
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<tr>
<td>Questionnaire (Levine-SSS)</td>
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<tr>
<td>Symptom recurrence (general)</td>
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### TABLE 137: SUMMARY OF FINDINGS PICO 7 PART 3 OPEN (EARLY FOLLOW-UP (3 MONTHS UP TO 1 YEAR))

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<td>Favors treatment 1</td>
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<tr>
<td>Favors treatment 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not significant</td>
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</tbody>
</table>

#### Complications
- **Symptom occurrence (pillar pain)**
  - 90 days: Favors treatment 1
  - 180 days: Not significant

- **Symptom occurrence (scar tenderness)**
  - 90 days: Favors treatment 1
  - 180 days: Not significant

#### Function
- **Grip Strength**: Not significant
- **Pinch Strength**: Not significant
- **Questionnaire (BWCTQ-FSS)**: Not significant

#### Other
- **Questionnaire (DASH)**: Not significant

#### Symptoms
- **Questionnaire (BWCTQ-SSS)**: Not significant
### TABLE 138: SUMMARY OF FINDINGS PICO 7 PART 4 SURGICAL VS. CONSERVATIVE (EARLY FOLLOW-UP (3 MONTHS UP TO 1 YEAR))

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</tr>
<tr>
<td>Favors treatment 1</td>
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<tr>
<td>Favors treatment 2</td>
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<tr>
<td>Not significant</td>
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<td>Gerritsen, A.A., 2002</td>
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<td>Ismatullah, I., 2013</td>
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<td>Jarvik, J.G., 2009</td>
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<td>Andreu, J.L., 2013</td>
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<td>&lt;20% VAS score</td>
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<td>Favors treatment 1</td>
<td>✅</td>
<td></td>
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<td>Favors treatment 2</td>
<td>⚫</td>
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<tr>
<td>Not significant</td>
<td>⬜</td>
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### Complications

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<tr>
<td>Discomfort caused by splint</td>
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<tr>
<td>Overall</td>
<td>⬜</td>
<td></td>
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<tr>
<td>Reflex sympathetic dystrophy</td>
<td>⬜</td>
<td>⬜</td>
<td>NA</td>
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<tr>
<td>Scar pain</td>
<td>⬜</td>
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<tr>
<td>Skin irritation</td>
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<td>NA</td>
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<tr>
<td>Stiffness of wrist, hands, or fingers</td>
<td>⬜</td>
<td>⬜</td>
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<tr>
<td>Swelling of the wrist, hand or fingers</td>
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<tr>
<th>Complications (infection)</th>
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### Function

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<th>Questionnaire (General/Undefined)</th>
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<td>Reached 20% improvement in functional impairment on 100mm VAS scale</td>
<td>⬜</td>
<td>⬜</td>
<td>NA</td>
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<tr>
<td>Reached 50% improvement in functional impairment on 100mm VAS scale</td>
<td>⬜</td>
<td>⬜</td>
<td>NA</td>
</tr>
<tr>
<td>Reached 70% improvement in functional impairment on 100mm VAS scale</td>
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### Pain

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<th>Symptom recurrence (nocturnal pain)</th>
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<thead>
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<th>Symptom relief (pain)</th>
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<tbody>
<tr>
<td>Reached 20% improvement in pain on VAS 100mm scale</td>
<td>⬜</td>
<td>⬜</td>
<td>NA</td>
</tr>
<tr>
<td>Reached 50% improvement in pain on VAS 100mm scale</td>
<td>⬜</td>
<td>⬜</td>
<td>NA</td>
</tr>
<tr>
<td>Reached 70% improvement in pain on VAS 100mm scale</td>
<td>⬜</td>
<td>⬜</td>
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### Symptoms

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<th>Paresthesia</th>
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<td>Daytime paresthesia</td>
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<td>Reached 20% improvement in nocturnal parthesia on VAS 100mm scale</td>
<td>⬜</td>
<td>⬜</td>
<td>NA</td>
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<tr>
<td>Reached 50% improvement in nocturnal parthesia on VAS 100mm scale</td>
<td>⬜</td>
<td>⬜</td>
<td>NA</td>
</tr>
<tr>
<td>Reached 70% improvement in nocturnal parthesia on VAS 100mm scale</td>
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<th>Questionnaire (Levine-SSS)</th>
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**DETAILED DATA FINDINGS**

**TABLE 140: PICO 7 PART 1- ENDOSCOPIC: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P 1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P 2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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</thead>
<tbody>
<tr>
<td>Atroshi. I., 2009</td>
<td>High Quality</td>
<td>Surgery failure (reoperation) (Reoperation)</td>
<td>5 years</td>
<td>CT release (endoscopic) (2-portal endoscopic release)</td>
<td>63</td>
<td>4.76%</td>
<td>CT release (open) (Open carpal tunnel release)</td>
<td>65</td>
<td>4.62%</td>
<td>RR</td>
<td>1.03(0.22, 4.92)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 15 mm arthroscope. After transaction the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P 1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P 2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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<tbody>
<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain) ( )</td>
<td>3 months</td>
<td>CT release (endoscopic ) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 15 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Larsen,M.B., 2013</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain)</td>
<td>5.5 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 15 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>.%</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1/P 1 (SD1)</td>
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<td>Mean2/P 2 (SD2)</td>
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<td>Favored Treatment</td>
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<td>Larsen,M.B., 2013</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain)</td>
<td>5.5 months</td>
<td>CT release (endoscopic ) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 15 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
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<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
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<td>Favored Treatment</td>
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<td>Malhotra, R., 2007</td>
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<td>Symptom occurrence (scar tenderness)</td>
<td>5.9 months</td>
<td>CT release (endoscopic ) (single portal endoscopic release)</td>
<td>CT release (open) (short incision open release)</td>
<td>RD</td>
<td>-0.29(-0.45,-0.13)</td>
<td>CT release (endoscopic ) (single portal endoscopic release) (P-value&lt;.05)</td>
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<td>Saw, N.L., 2003</td>
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<td>Trumble, T.E., 2002</td>
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<td>Symptom occurrence (scar tenderness)(Loads of pressure (in kg) able to withstand)</td>
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<td>CT release (open) (3-4cm incision)</td>
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<td>Symptom occurrence (pillar pain)(Radial pillar pain)</td>
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<td>CT release (endoscopic ) (two-portal endoscopic release)</td>
<td>CT release (open-limited) (limited-open release)</td>
<td>. %</td>
<td>Author Reported</td>
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<td>High Quality</td>
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<td>Reference Title</td>
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<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (pillar pain)(Radial pillar pain (0=none to 4=severe))</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
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<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (pillar pain)(Radial pillar pain (0=none to 4=severe))</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (scar tenderness)(0=none to 4=severe)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
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<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (scar tenderness)(0=none to 4=severe)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
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<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Tian,Y., 2007</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (scar tenderness)(Rate of scar tenderness)</td>
<td>2 years</td>
<td>CT release (endoscopic ) (one-portal endoscopics release)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open) (traditional open release)</td>
<td>32</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (endoscopic ) (one-portal endoscopics release) (P-value&lt;.05)</td>
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### TABLE 141: PICO 7 PART 1- ENDOSCOPIC: OTHER QUESTIONNAIRE

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<th>Reference Title</th>
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<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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</thead>
<tbody>
<tr>
<td>Kang,H.J., 2013</td>
<td>High Quality</td>
<td>Questionnaire (DASH)( )</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release using the Agee technique)</td>
<td>52</td>
<td>11(11.04)</td>
<td>CT release (mini) (1.5-cm incision was made in the proximal palm over the transverse carpal ligament)</td>
<td>52</td>
<td>11(11.04)</td>
<td>Mean Difference</td>
<td>0(-4.24,4.24)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>MacDermid,J.C., 2003</td>
<td>High Quality</td>
<td>Questionnaire (SF-36)(Physical health- SF-36)</td>
<td>3 months</td>
<td>CT release (endoscopic) (2 portal Chow technique)</td>
<td>32</td>
<td>47(.)</td>
<td>CT release (open) (traditional long incision open release)</td>
<td>91</td>
<td>42(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Treatment 2 (Details)</td>
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<tr>
<td>Atroshi,I., 2006</td>
<td>High Quality</td>
<td>Grip strength(Units not reported)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneous ly at the proximal and distal portals)</td>
<td>63</td>
<td>31.5(11.00)</td>
<td>CT release (open) (Open carpal tunnel release along the length of the incision)</td>
<td>65</td>
<td>29.9(11.00)</td>
<td>Mean Difference</td>
<td>1.6(-2.21,5.411770)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Atroshi,I., 2006</td>
<td>High Quality</td>
<td>Pinch Strength(Units not reported)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneous ly at the proximal and distal portals)</td>
<td>63</td>
<td>6.7(2.20)</td>
<td>CT release (open) (Open carpal tunnel release along the length of the incision)</td>
<td>65</td>
<td>6(1.80)</td>
<td>Mean Difference</td>
<td>0.7(0.00,1.397582)</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneous ly at the proximal and distal portals) (P-value&lt;.05)</td>
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<tr>
<td>Atroshi,I., 2009</td>
<td>High Quality</td>
<td>Questionnaire (CTQ)(CTSQ functional status scale)</td>
<td>1 years</td>
<td>CT release (endoscopic) (2-portal endoscopic release)</td>
<td>63</td>
<td>1.25(0.50)</td>
<td>CT release (open) (Open carpal tunnel release)</td>
<td>65</td>
<td>1.19(0.40)</td>
<td>Mean Difference</td>
<td>0.06(-0.10,0.217164)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Atroshi,I., 2009</td>
<td>High Quality</td>
<td>Questionnaire (CTQ)(CTSQ functional status scale)</td>
<td>5 years</td>
<td>CT release (endoscopic) (2-portal endoscopic release)</td>
<td>63</td>
<td>1.3(0.50)</td>
<td>CT release (open) (Open carpal tunnel release)</td>
<td>63</td>
<td>1.29(0.50)</td>
<td>Mean Difference</td>
<td>0.01(-0.16,0.184610)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Ejiri,S., 2012</td>
<td>High Quality</td>
<td>Grip strength(Kilograms)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Okutsu method)</td>
<td>40</td>
<td>. %</td>
<td>CT release (open) (3cm palmar incision)</td>
<td>39</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Duration</td>
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<td>Result (95% CI)</td>
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<tr>
<td>Ejiri,S., 2012</td>
<td>High Quality</td>
<td>Semmes Weinstein Monofilaments Test (SW test) (lower scores=improvement)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Okutsu method)</td>
<td>40</td>
<td>-0.49(.)</td>
<td>CT release (open) (3cm palmar incision)</td>
<td>39</td>
<td>-0.24(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Ejiri,S., 2012</td>
<td>High Quality</td>
<td>Two-point discrimination (Millimeters)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Okutsu method)</td>
<td>40</td>
<td>-3.3(.)</td>
<td>CT release (open) (3cm palmar incision)</td>
<td>39</td>
<td>-1.7(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Kang,H.J., 2013</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release using the Agee technique)</td>
<td>52</td>
<td>1.5(0.37)</td>
<td>CT release (mini) (1.5-cm incision was made in the proximal palm over the transverse carpal ligament)</td>
<td>52</td>
<td>1.7(-0.74)</td>
<td>Mean Difference</td>
<td>-0.2(-0.42,0.02)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Larsen, M.B., 2013</td>
<td>High</td>
<td>Grip strength (Percentage of contralateral hand)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Larsen,M.B., 2013</td>
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<td>Grip strength (Percentage of contralateral hand)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied) (P-value&lt;.05)</td>
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<td>Larsen,M.B., 2013</td>
<td>High Quality</td>
<td>Grip strength(Percentage of contralateral hand)</td>
<td>5.5 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Grip strength (Percentage of contralateral hand)</td>
<td>5.5 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Reference Title</td>
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<tr>
<td>Larsen,M.B., 2013</td>
<td>High Quality</td>
<td>Range of motion( )</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Range of motion( )</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Range of motion ( )</td>
<td>5.5 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transection the skin was sutured and a soft dressing without splinting applied)</td>
<td>.</td>
<td>. %</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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</table>

Larsen, M.B., 2013: High Quality. Range of motion was measured and compared between two treatment groups. Treatment 1 involved CT release using the Linvatec system as described by Menon (1993), while Treatment 2 involved an open CT release with a 7 cm curved incision. The outcomes were statistically analyzed and found not to be significant (P-value>.05).
<table>
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<tr>
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<td>Larsen.M.B., 2013</td>
<td>High Quality</td>
<td>Range of motion( ) 5.5 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>.</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissors for dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>MacDermid, J. C., 2003</td>
<td>High Quality</td>
<td>Grip strength (kilograms)</td>
<td>3 months</td>
<td>CT release (endoscopic) (2 portal Chow technique)</td>
<td>32</td>
<td>27(.)</td>
<td>CT release (open) (traditional long incision open release)</td>
<td>91</td>
<td>27(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>MacDermid, J. C., 2003</td>
<td>High Quality</td>
<td>Pinch Strength (key pinch) (kilograms)</td>
<td>3 months</td>
<td>CT release (endoscopic) (2 portal Chow technique)</td>
<td>32</td>
<td>7(.)</td>
<td>CT release (open) (traditional long incision open release)</td>
<td>91</td>
<td>5.6(.)</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Pinch Strength (tripod pinch) (kilograms)</td>
<td>3 months</td>
<td>CT release (endoscopic) (2 portal Chow technique)</td>
<td>32</td>
<td>6.7(.)</td>
<td>CT release (open) (traditional long incision open release)</td>
<td>91</td>
<td>6.5(.)</td>
<td>Author Reported</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Malhotra, R., 2007</td>
<td>High Quality</td>
<td>NCS (DML) (distal motor latency (ms))</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Malhotra, R., 2007</td>
<td>High Quality</td>
<td>NCS (NCV) (nerve conduction velocity (ms))</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Saw, N.L., 2003</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS) (Levine functional score)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>74</td>
<td>. %</td>
<td>CT release (open) (Open CTR)</td>
<td>76</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sennwald,G.R., 1995</td>
<td>High Quality</td>
<td>Grip strength(Kilograms )</td>
<td>3 months</td>
<td>CT release (endoscopic) (two-portal Chow technique)</td>
<td>25</td>
<td>.%</td>
<td>CT release (open) (traditional open release)</td>
<td>22</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (endoscopic) (two-portal Chow technique) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Sennwald,G.R., 1995</td>
<td>High Quality</td>
<td>Key pinch strength(Kilograms )</td>
<td>3 months</td>
<td>CT release (endoscopic) (two-portal Chow technique)</td>
<td>25</td>
<td>.%</td>
<td>CT release (open) (traditional open release)</td>
<td>22</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Grip strength(Kilograms )</td>
<td>3 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>.%</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Hand dexterity(Jebsen-Taylor test)</td>
<td>12 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>32(.)</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>34(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Hand dexterity(Purdue pegboard test)</td>
<td>3 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>44(.)</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>44(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Pinch Strength(Kilograms )</td>
<td>3 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>7.9(.)</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>8.1(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS)(CTS-FSS (1=least functional difficulty, 5=severe functional difficulty))</td>
<td>3 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>1.7(0.10)</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>2.4(0.10)</td>
<td>Mean Difference</td>
<td>-0.7(-0.73,-0.66766)</td>
<td>CT release (endoscopic) (single portal endoscopic release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS)(CTS-FSS (1=least functional difficulty, 5=severe functional difficulty))</td>
<td>6 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>1.8(0.13)</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>1.8(0.09)</td>
<td>Mean Difference</td>
<td>0(-0.04,0.036025)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS)(CTS-FSS (1=least functional difficulty, 5=severe functional difficulty))</td>
<td>12 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>1.7(0.10)</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>1.7(0.11)</td>
<td>Mean Difference</td>
<td>0(-0.03,0.034026)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) ( )</td>
<td>12 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>3.26( )</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>3.2( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Wong,K.C., 2003</td>
<td>High Quality</td>
<td>Pinch Strength(% improvement from baseline (units not reported))</td>
<td>1 years</td>
<td>CT release (endoscopic) (two-portal endoscopic release)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open-limited) (limited-open release)</td>
<td>29</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Wong,K.C., 2003</td>
<td>High Quality</td>
<td>Two-point discrimination(Millimeters)</td>
<td>1 years</td>
<td>CT release (endoscopic) (two-portal endoscopic release)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open-limited) (limited-open release)</td>
<td>29</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate</td>
<td>Grip strength(Jamar grip (mean percent change from baseline))</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>72</td>
<td>. %</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>55</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate</td>
<td>Grip strength(Jamar grip (mean percent change from baseline))</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>64</td>
<td>. %</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>48</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate</td>
<td>Hand dexterity(fine dexterity loss)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>74</td>
<td>14.86%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>55</td>
<td>12.73%</td>
<td>RR</td>
<td>1.17(0.48,2.82)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate</td>
<td>Hand dexterity(fine dexterity loss)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>65</td>
<td>12.31%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>48</td>
<td>12.50%</td>
<td>RR</td>
<td>0.98(0.37,2.65)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>RR</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Agee J.M., 1992</td>
<td>Moderate</td>
<td>Key pinch strength (Mean % change from baseline)</td>
<td>1.1 weeks</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>64</td>
<td>. %</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>55</td>
<td>. %</td>
<td></td>
<td>Author Reported</td>
<td>NA</td>
</tr>
<tr>
<td>Agee J.M., 1992</td>
<td>Moderate</td>
<td>Key pinch strength (Mean % change from baseline)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>72</td>
<td>. %</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>48</td>
<td>. %</td>
<td></td>
<td>Author Reported</td>
<td>NA</td>
</tr>
<tr>
<td>Agee J.M., 1992</td>
<td>Moderate</td>
<td>Phalen's test score (% negative)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>64</td>
<td>92.19%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>46</td>
<td>93.48%</td>
<td>0.99(0.89,1.09)</td>
<td>RR</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee J.M., 1992</td>
<td>Moderate</td>
<td>Pinch strength (pulp pinch) (Mean % change from pre-op value (units not reported))</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>72</td>
<td>. %</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>55</td>
<td>. %</td>
<td></td>
<td>Author Reported</td>
<td>NA</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Pinch strength (pulp pinch)(Mean % change from pre-op value (units not reported))</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>64</td>
<td>. %</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>48</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Range of motion(Manual motor testing for thumb abduction (patients testing normal))</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>74</td>
<td>81.08%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>74</td>
<td>74.32%</td>
<td>RR</td>
<td>1.09(0.92,1.30)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Range of motion(Manual motor testing for thumb abduction (patients testing normal))</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>63</td>
<td>80.95%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>83</td>
<td>83.13%</td>
<td>RR</td>
<td>0.97(0.83,1.14)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test)(Thumb, patients testing normal)</td>
<td>1.1 weeks</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>57</td>
<td>71.93%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>27</td>
<td>48.15%</td>
<td>RR</td>
<td>1.49(0.98,2.28)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) (Index finger, Patients testing normal)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>RR</td>
<td>1.20(0.77,1.87)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) (Little finger, Patients testing normal)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>RR</td>
<td>0.89(0.70,1.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) (Long finger, Patients testing normal)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>RR</td>
<td>0.97(0.68,1.39)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) (Thumb, Patients testing normal)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>RR</td>
<td>0.67(0.44,1.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Agee, J.M., 1992</td>
<td>Moderate Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) (Index finger, Patients testing normal)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>57</td>
<td>73.68%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>42</td>
<td>80.95%</td>
<td>RR</td>
<td>0.91(0.74,1.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee, J.M., 1992</td>
<td>Moderate Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) (Little finger, Patients testing normal)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>57</td>
<td>89.47%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>42</td>
<td>90.48%</td>
<td>RR</td>
<td>0.99(0.87,1.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee, J.M., 1992</td>
<td>Moderate Quality</td>
<td>Semmes-Weinstein Monofilaments Test (SW test) (Long finger, Patients testing normal)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>57</td>
<td>89.47%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>42</td>
<td>76.19%</td>
<td>RR</td>
<td>1.17(0.97,1.42)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Agee, J.M., 1992</td>
<td>Moderate Quality</td>
<td>Tinel's Sign/Test (% negative)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>64</td>
<td>87.50%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>46</td>
<td>82.61%</td>
<td>RR</td>
<td>1.06(0.90,1.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Phalen's test score(% positive)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>6.25%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
<td>10.71%</td>
<td>RR</td>
<td>0.58(0.10,3.24)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Phalen's test score(% positive)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>6.25%</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
<td>13.89%</td>
<td>RR</td>
<td>0.46(0.10,2.22)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Tinel's Sign/Test(# positive)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>12.50%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
<td>10.71%</td>
<td>RR</td>
<td>1.17(0.29,4.77)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Tinel's Sign/Test(# positive)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>12.50%</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
<td>19.44%</td>
<td>RR</td>
<td>0.64(0.21,1.99)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dumontier,C., 1995</td>
<td>Moderate Quality</td>
<td>Grip strength(Kilograms)</td>
<td>3 months</td>
<td>CT release (endoscopic) (two-portal endoscopic release)</td>
<td>28</td>
<td>. %</td>
<td>CT release (open) (Conventional palmer open release)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (endoscopic) (two-portal endoscopic release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ferdinand,R.D., 2002</td>
<td>Moderate Quality</td>
<td>Grip strength(Pounds)</td>
<td>1 years</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>25</td>
<td>. %</td>
<td>CT release (open) (traditional open release)</td>
<td>25</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ferdinand,R.D., 2002</td>
<td>Moderate Quality</td>
<td>Jebsen Taylor score(Seconds)</td>
<td>1 years</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>25</td>
<td>. %</td>
<td>CT release (open) (traditional open release)</td>
<td>25</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Ferdinand, R.D., 2002</td>
<td>Moderate Quality</td>
<td>Two-point discrimination (Millimeters)</td>
<td>1 years</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>25</td>
<td>. %</td>
<td>CT release (open) (traditional open release)</td>
<td>25</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Jacobsen, M.B., 1996</td>
<td>Moderate Quality</td>
<td>Two-point discrimination (Millimeters)</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (two-portal Chow technique)</td>
<td>16</td>
<td>2.94(0.56)</td>
<td>CT release (open) (traditional open release)</td>
<td>16</td>
<td>3.25(1.30)</td>
<td>Mean Difference</td>
<td>-0.31(-1.00,0.383588)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tian, Y., 2007</td>
<td>Moderate Quality</td>
<td>Two-point discrimination (Units not specified)</td>
<td>2 years</td>
<td>CT release (endoscopic) (one-portal endoscopics release)</td>
<td>30</td>
<td>5.9(1.50)</td>
<td>CT release (open) (traditional open release)</td>
<td>32</td>
<td>5.3(1.70)</td>
<td>Mean Difference</td>
<td>0.6(-0.20,1.396909)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
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## TABLE 143: PICO 7 PART 1- ENDOSCOPIC: OTHER

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atroshi,I., 2009</td>
<td>High Quality</td>
<td>Patient satisfaction (general)(Completely or very satisfied)</td>
<td>5 years</td>
<td>CT release (endoscopic) (2-portal endoscopic release)</td>
<td>63</td>
<td>85.71%</td>
<td>CT release (open) (Open carpal tunnel release)</td>
<td>63</td>
<td>82.54%</td>
<td>RR</td>
<td>1.04(0.89,1.21)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kang,H.J., 2013</td>
<td>High Quality</td>
<td>Patient satisfaction (general)(Preferred Endoscopic CTR)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release using the Agee technique)</td>
<td>52</td>
<td>65.38%</td>
<td>CT release (mini) (1.5-cm incision was made in the proximal palm over the transverse carpal ligament)</td>
<td>52</td>
<td>65.38%</td>
<td>RR</td>
<td>1.00(0.76,1.32)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Patient satisfaction (general)(1=least satisfied to 5=most satisfied)</td>
<td>3 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>4.4(0.13)</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>4(0.14)</td>
<td>Mean Difference</td>
<td>0.4(0.36,0.443719)</td>
<td>CT release (endoscopic) (single portal endoscopic release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Patient satisfaction (general)(1=least satisfied to 5=most satisfied)</td>
<td>6 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>4.5(0.12)</td>
<td>CT release (open) (3-4cm incision)</td>
<td>72</td>
<td>4.5(0.12)</td>
<td>Mean Difference</td>
<td>0(-0.04,0.038806)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Trumble, T.E., 2002</td>
<td>High Quality</td>
<td>Patient satisfaction (general) (1=least satisfied to 5=most satisfied)</td>
<td>12 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>4.6(0.11)</td>
<td>CT release (open) (3-4 cm incision)</td>
<td>72</td>
<td>4.5(0.13)</td>
<td>Mean Difference</td>
<td>0.1(0.06, 0.139006)</td>
<td>CT release (endoscopic) (single portal endoscopic release) (P-value&lt;.05)</td>
</tr>
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</table>
### TABLE 144: PICO 7 PART 1- ENDOSCOPIC: PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Treatment 2 (Details)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atroshi, I., 2009</td>
<td>High Quality</td>
<td>Symptom relief (pain)(No scar or palm pain)</td>
<td>5 years</td>
<td>CT release (endoscopic) (2-portal endoscopic release)</td>
<td>CT release (open) (Open carpal tunnel release)</td>
<td>RR</td>
<td>1.02(0.87,1.19)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>. %</td>
<td>. %</td>
<td>Author Reported</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>5.5 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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</tr>
<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)</td>
<td>5.5 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>.%</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angled over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
</tr>
<tr>
<td>MacDermid, J.C., 2003</td>
<td>High Quality</td>
<td>Symptom relief (pain) (McGill pain questionnaire)</td>
<td>3 months</td>
<td>CT release (endoscopic) (2 portal Chow technique)</td>
<td>32</td>
<td>12(,)</td>
<td>CT release (open) (traditional long incision open release)</td>
<td>91</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Malhotra, R., 2007</td>
<td>High</td>
<td>Symptom recurrence (pain) (Patients reporting pain in 4-6 range on 10 cm VAS scale)</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>6.67%</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
</tr>
<tr>
<td>Malhotra, R., 2007</td>
<td>High</td>
<td>Symptom relief (pain) (50-75% improvement)</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>3.33%</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
</tr>
<tr>
<td>Malhotra, R., 2007</td>
<td>High</td>
<td>Symptom relief (pain) (Patients reporting pain in 0-3 range on 10 cm VAS scale)</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>93.33%</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
</tr>
<tr>
<td>Wong, K.C., 2003</td>
<td>High</td>
<td>Questionnaire/Scale (VAS-pain)</td>
<td>1 years</td>
<td>CT release (endoscopic) (two-portal endoscopic release)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open-limited) (limited-open release)</td>
<td>30</td>
</tr>
<tr>
<td>Aslani, H.R., 2012</td>
<td>Moderate</td>
<td>Symptom recurrence (general) (Night pain)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>0.00%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
</tr>
<tr>
<td>Aslani, H.R., 2012</td>
<td>Moderate</td>
<td>Symptom recurrence (general) (Night pain)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>0.00%</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
</tr>
<tr>
<td>Aslani, H.R., 2012</td>
<td>Moderate</td>
<td>Symptom recurrence (general) (Wrist pain)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>12.50%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Aslani, H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general) (Wrist pain)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>12.50%</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
</tr>
<tr>
<td>Dumontier, C., 1995</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (pain) (Patients still reporting pain)</td>
<td>3 months</td>
<td>CT release (endoscopic) (two-portal endoscopic release)</td>
<td>28</td>
<td>39.29%</td>
<td>CT release (open) (Conventional palmar open release)</td>
<td>30</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Jacobsen, M.B., 1996</td>
<td>Moderate Quality</td>
<td>Analgesia (duration)(Postoperative analgesia use)</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (two-portal Chow technique)</td>
<td>16</td>
<td>5.5(+)</td>
<td>CT release (open) (traditional open release)</td>
<td>16</td>
</tr>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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</tr>
<tr>
<td>Atroshi, I., 2006</td>
<td>High Quality</td>
<td>Activity of daily living (ADL) (Carpal tunnel syndrome functional status)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneously at the proximal and distal portals)</td>
<td>63</td>
<td>1.3(0.50)</td>
<td>CT release (open) (Open carpal tunnel release along the length of the incision)</td>
<td>65</td>
</tr>
<tr>
<td>Atroshi, I., 2006</td>
<td>High Quality</td>
<td>Activity of daily living (ADL) (Carpal tunnel syndrome functional status)</td>
<td>11.8 months</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneously at the proximal and distal portals)</td>
<td>63</td>
<td>1.3(0.50)</td>
<td>CT release (open) (Open carpal tunnel release along the length of the incision)</td>
<td>65</td>
</tr>
<tr>
<td>Ejiri, S., 2012</td>
<td>High Quality</td>
<td>Activity of daily living (ADL) (Book Holding (100mm VAS))</td>
<td>3 months</td>
<td>CT release (endoscopic) (Okutsu method)</td>
<td>40</td>
<td>-23.7(.)</td>
<td>CT release (open) (3cm palmar incision)</td>
<td>39</td>
</tr>
<tr>
<td>Ejiri, S., 2012</td>
<td>High Quality</td>
<td>Activity of daily living (ADL) (Buttoning (100mm VAS))</td>
<td>3 months</td>
<td>CT release (endoscopic) (Okutsu method)</td>
<td>40</td>
<td>-22.2(.)</td>
<td>CT release (open) (3cm palmar incision)</td>
<td>39</td>
</tr>
<tr>
<td>Ejiri, S., 2012</td>
<td>High Quality</td>
<td>Activity of daily living (ADL) (Chopstick use (100mm VAS))</td>
<td>3 months</td>
<td>CT release (endoscopic) (Okutsu method)</td>
<td>40</td>
<td>-21.1(.)</td>
<td>CT release (open) (3cm palmar incision)</td>
<td>39</td>
</tr>
<tr>
<td>Ejiri, S., 2012</td>
<td>High Quality</td>
<td>Activity of daily living (ADL) (Receiver holding (100mm VAS))</td>
<td>3 months</td>
<td>CT release (endoscopic) (Okutsu method)</td>
<td>40</td>
<td>-20.8(.)</td>
<td>CT release (open) (3cm palmar incision)</td>
<td>39</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
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<tr>
<td>Ejiri,S., 2012</td>
<td>High Quality</td>
<td>Activity of daily living (ADL)(Writing (100mm VAS))</td>
<td>3 months</td>
<td>CT release (endoscopic) (Okutsu method)</td>
<td>40</td>
<td>-16.2(.)</td>
<td>CT release (open) (3cm palmar incision)</td>
<td>39</td>
</tr>
<tr>
<td>Malhotra,R., 2007</td>
<td>High Quality</td>
<td>Patient satisfaction (general)(Subjective improvement-excellent (Excellent, good, no improvement, or worse))</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>83.33%</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
</tr>
<tr>
<td>Malhotra,R., 2007</td>
<td>High Quality</td>
<td>Patient satisfaction (general)(Subjective improvement-good (Excellent, good, no improvement, or worse))</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>16.67%</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
</tr>
<tr>
<td>Saw,N.L., 2003</td>
<td>High Quality</td>
<td>Return to Work(Days off work)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>74</td>
<td>18(11.00)</td>
<td>CT release (open) (Open CTR)</td>
<td>76</td>
</tr>
<tr>
<td>Dumontier,C., 1995</td>
<td>Moderate Quality</td>
<td>Return to Work( )</td>
<td>3 months</td>
<td>CT release (open) (Conventional palmar open release)</td>
<td>30</td>
<td>. %</td>
<td>CT release (endoscopic) (two-portal endoscopic release)</td>
<td>28</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Atroshi,I., 2006</td>
<td>High Quality</td>
<td>Symptom recurrence (general)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneously at the proximal and distal portals)</td>
<td>CT release (open) (Open carpal tunnel release along the length of the incision)</td>
<td>Mean Difference</td>
<td>-12.7(-20.75, -4.64633)</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneously at the proximal and distal portals) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Atroshi,I., 2006</td>
<td>High Quality</td>
<td>Symptom recurrence (general)</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneously at the proximal and distal portals)</td>
<td>CT release (open) (Open carpal tunnel release along the length of the incision)</td>
<td>Mean Difference</td>
<td>.(..)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Atroshi,I., 2006</td>
<td>High Quality</td>
<td>Symptom recurrence (general)</td>
<td>11.8 months</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneously at the proximal and distal portals)</td>
<td>CT release (open) (Open carpal tunnel release along the length of the incision)</td>
<td>Mean Difference</td>
<td>-5.2(-12.65,2.249586)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Atroshi,I., 2006</td>
<td>High Quality</td>
<td>Symptom recurrence (general)(Score range; carpal tunnel syndrome, 1 (no symptoms or disability) to 5 (most severe symptoms or disability))</td>
<td>11.8 months</td>
<td>CT release (endoscopic) (Endoscopic release injected subcutaneously at the proximal and distal portals)</td>
<td>63</td>
<td>1.4(0.60)</td>
<td>CT release (open) (Open carpal tunnel release along the length of the incision)</td>
<td>65</td>
</tr>
<tr>
<td>Atroshi,I., 2009</td>
<td>High Quality</td>
<td>Questionnaire (CTQ)(CTSQ symptoms severity scale)</td>
<td>1 years</td>
<td>CT release (endoscopic) (2-portal endoscopic release)</td>
<td>63</td>
<td>1.4(0.60)</td>
<td>CT release (open) (Open carpal tunnel release)</td>
<td>65</td>
</tr>
<tr>
<td>Atroshi,I., 2009</td>
<td>High Quality</td>
<td>Questionnaire (CTQ)(CTSQ symptoms severity scale)</td>
<td>5 years</td>
<td>CT release (endoscopic) (2-portal endoscopic release)</td>
<td>63</td>
<td>1.45(0.70)</td>
<td>CT release (open) (Open carpal tunnel release)</td>
<td>63</td>
</tr>
<tr>
<td>Kang,H.J., 2013</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release using the Agee technique)</td>
<td>52</td>
<td>1.5(0.37)</td>
<td>CT release (mini) (1.5-cm incision was made in the proximal palm over the transverse carpal ligament)</td>
<td>52</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Paresthesia (Paresthesia (VAS scale))</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Paresthesia(Paresthesia (VAS scale))</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>.%</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Paresthesia (Paresthesia (VAS scale))</td>
<td>5.5 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Paresthesia (Paresthesia (VAS scale))</td>
<td>5.5 months</td>
<td>CT release (endoscopic) (Endoscopic procedure using the Linvatec system as described by Menon (1993), which is a one-portal technique with a short transverse incision at the wrist using a disposable set of endoscopic instruments and a conventional 5 mm arthroscope. After transsection the skin was sutured and a soft dressing without splinting applied)</td>
<td>30</td>
<td>. %</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
</tr>
<tr>
<td>MacDermid, J.C., 2003</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)(Levine’s symptom severity score)</td>
<td>3 months</td>
<td>CT release (endoscopic) (2 portal Chow technique)</td>
<td>91</td>
<td>1.8(.)</td>
<td>CT release (open) (traditional long incision open release)</td>
<td>32</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Malhotra,R., 2007</td>
<td>High Quality</td>
<td>Symptom recurrence (numbness) ()</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>6.67%</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
</tr>
<tr>
<td>Malhotra,R., 2007</td>
<td>High Quality</td>
<td>Symptom recurrence (weakness) ()</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>6.67%</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
</tr>
<tr>
<td>Malhotra,R., 2007</td>
<td>High Quality</td>
<td>Symptom relief (general)(&gt;75% improvement)</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>20.00%</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
</tr>
<tr>
<td>Malhotra,R., 2007</td>
<td>High Quality</td>
<td>Symptom relief (general)(100% improvement)</td>
<td>5.9 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>30</td>
<td>76.67%</td>
<td>CT release (open) (short incision open release)</td>
<td>31</td>
</tr>
<tr>
<td>Saw,N.L., 2003</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS) ()</td>
<td>3 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>74</td>
<td>. %</td>
<td>CT release (open) (Open CTR)</td>
<td>76</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)(CTS-SSS (1=fewest symptoms, 5=severe))</td>
<td>3 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>1.8(0.14)</td>
<td>CT release (open) (3-4 cm incision)</td>
<td>72</td>
</tr>
<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)(CTS-SSS (1=fewest symptoms, 5=severe))</td>
<td>6 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>75</td>
<td>1.7(0.13)</td>
<td>CT release (open) (3-4 cm incision)</td>
<td>72</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Trumble,T.E., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)(CTS-SSS (1=fewest symptoms, 5=severe))</td>
<td>12 months</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>CT release (open) (3-4cm incision)</td>
<td>Mean Difference</td>
<td>0(-0.04,0.041061)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Wong,K.C., 2003</td>
<td>High Quality</td>
<td>Symptom relief (general)(complete relief of symptoms)</td>
<td>1 years</td>
<td>CT release (endoscopic) (two-portal endoscopic release)</td>
<td>CT release (open- limited) (limited-open release)</td>
<td>RR</td>
<td>0.86(0.57,1.30)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (numbness)(Patients with symptoms still present)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>RR</td>
<td>1.70(0.75,3.84)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (numbness)(Patients with symptoms still present)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>RR</td>
<td>0.66(0.27,1.58)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (pain)(Nocturnal pain, patients with symptoms still present)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>RR</td>
<td>0.99(0.36,2.69)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (pain)(Nocturnal pain, patients with symptoms still present)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>RR</td>
<td>0.92(0.26,3.26)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (tingling)(Patients with symptoms still present)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>74</td>
<td>20.27%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>55</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (tingling)(Patients with symptoms still present)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>65</td>
<td>13.85%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>48</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (weakness)(Patients with symptoms still present)</td>
<td>3 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>74</td>
<td>32.43%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>55</td>
</tr>
<tr>
<td>Agee,J.M., 1992</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (weakness)(Patients with symptoms still present)</td>
<td>6 months</td>
<td>CT release (endoscopic w/ 3M device) (Endoscopic device inserted into incision at wrist)</td>
<td>65</td>
<td>20.00%</td>
<td>CT release (open) (Conventional open surgery)</td>
<td>48</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general)(Stiffness)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>12.50%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general)(Stiffness)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>12.50%</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2</td>
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<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general)(Weakness)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>6.25%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general)(Weakness)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>6.25%</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (numbness)(Numbness)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>0.00%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (numbness)(Numbness)</td>
<td>3.9 months</td>
<td>CT release (endoscopic) (Endoscopic release)</td>
<td>32</td>
<td>0.00%</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
</tr>
<tr>
<td>Ferdinand,R.D., 2002</td>
<td>Moderate Quality</td>
<td>Symptom relief (general)</td>
<td>1 years</td>
<td>CT release (endoscopic) (single portal endoscopic release)</td>
<td>25</td>
<td>. %</td>
<td>CT release (open) (traditional open release)</td>
<td>25</td>
</tr>
<tr>
<td>Tian,Y., 2007</td>
<td>Moderate Quality</td>
<td>Symptom relief (general)(Patient satisfaction: excellent to good)</td>
<td>2 years</td>
<td>CT release (endoscopic) (one-portal endoscopics release)</td>
<td>30</td>
<td>93.33%</td>
<td>CT release (open) (traditional open release)</td>
<td>32</td>
</tr>
</tbody>
</table>
TABLE 148: PICO 7 PART 2- MINI: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cresswell,T.R., 2008</td>
<td>High</td>
<td>Complications (general)(Rate of complications)</td>
<td>3 months</td>
<td>CT release (open) (Standard limited open palmer release)</td>
<td>100</td>
<td>2.00%</td>
<td>CT release (mini-Indiana Tome)</td>
<td>95</td>
<td>9.47%</td>
<td>RR</td>
<td>0.21(0.05,0.95)</td>
<td>CT release (open) (Standard limited open palmer release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Cresswell,T.R., 2008</td>
<td>High</td>
<td>Symptom occurrence (scar tenderness)( )</td>
<td>3 months</td>
<td>CT release (open) (Standard limited open palmer release)</td>
<td>88</td>
<td>1.9(.)</td>
<td>CT release (mini-Indiana Tome)</td>
<td>88</td>
<td>1.7(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Jugovac,I., 2002</td>
<td>High</td>
<td>Symptom occurrence (scar tenderness)(Tenderness)</td>
<td>3 months</td>
<td>CT release (open) (Traditional technique)</td>
<td>36</td>
<td>22.22%</td>
<td>CT release (mini-limited incision) (limited palmer incision)</td>
<td>36</td>
<td>8.33%</td>
<td>RR</td>
<td>2.67(0.77,9.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain) ( )</td>
<td>3 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt; .05)</td>
<td></td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Larsen,M.B., 2013</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain) ( )</td>
<td>5.5 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Yucetas,S.C., 2013</td>
<td>High Quality</td>
<td>Complications (general)(Complications or reoperation within 6 months)</td>
<td>5.9 months</td>
<td>CT release (open) (Standard open CTR)</td>
<td>37</td>
<td>18.92%</td>
<td>CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)</td>
<td>38</td>
<td>5.26%</td>
<td>RR</td>
<td>3.59(0.80,16.19)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Faraj,A.A., 2012</td>
<td>Moderate</td>
<td>Symptom occurrence (scar length)(Length of scar (cm))</td>
<td>3 months</td>
<td>CT release (open) (traditional open release)</td>
<td>20</td>
<td>5.15(0.26)</td>
<td>CT release (mini) (mini-transverse wrist incisions)</td>
<td>20</td>
<td>1.4(0.17)</td>
<td>Mean Difference</td>
<td>3.75(3.61,3.886145)</td>
<td>CT release (mini) (mini-transverse wrist incisions) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ucar,B.Y., 2012</td>
<td>Moderate</td>
<td>Symptom occurrence (scar pain)</td>
<td>2.5 years</td>
<td>CT release (Mini-incision distal to flexor crease (group 1)) (2cm longitudinal incision made distal to flexor crease)</td>
<td>45</td>
<td>24.44%</td>
<td>CT release (Mini-incision proximal to flexor crease (group 2)) (2cm longitudinal incision made proximal to flexor crease)</td>
<td>45</td>
<td>6.67%</td>
<td>RR</td>
<td>3.67(1.10,12.27)</td>
<td>CT release (Mini-incision proximal to flexor crease (group 2)) (2cm longitudinal incision made proximal to flexor crease) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/SD1</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/SD2</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Cellocco,P., 2005</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale)-Italian modified version)</td>
<td>1.6 years</td>
<td>CT release (open-limited open) (limited open CTR)</td>
<td>123</td>
<td>2.53(0)</td>
<td>CT release (mini-open blind technique) (mini-open blind technique)</td>
<td>99</td>
<td>2.02(0)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-open blind technique) (mini-open blind technique) (P-value&lt;.05)</td>
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<tr>
<td>Cellocco,P., 2005</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale)-Italian modified version)</td>
<td>2.5 years</td>
<td>CT release (open-limited open) (limited open CTR)</td>
<td>123</td>
<td>1.73(0)</td>
<td>CT release (mini-open blind technique) (mini-open blind technique)</td>
<td>99</td>
<td>1.87(0)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Cellocco,P., 2005</td>
<td>High Quality</td>
<td>Two-point discrimination(Millimeters)</td>
<td>2.5 years</td>
<td>CT release (open-limited open) (limited open CTR)</td>
<td>123</td>
<td>4.3(0)</td>
<td>CT release (mini-open blind technique) (mini-open blind technique)</td>
<td>99</td>
<td>4.7(0)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale)-Italian modified version)</td>
<td>1.6 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>123</td>
<td>2.05(0.82)</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>3.85(0.75)</td>
<td>Mean Difference</td>
<td>-1.8(-2.01,-1.59305)</td>
<td>CT release (open) (3-4cm long limited-open palmar incision) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale)-Italian modified version)</td>
<td>2.5 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>123</td>
<td>1.39(0.72)</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>1.28(0.52)</td>
<td>Mean Difference</td>
<td>0.11(0.05,0.273351)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorited Treatment</td>
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<tr>
<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale)-Italian modified version)</td>
<td>4.9 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>123</td>
<td>1.38(0.83)</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>1.33(0.64)</td>
<td>Mean Difference</td>
<td>0.05(-0.14,0.243417)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Two-point discrimination(Millimeters)</td>
<td>4.9 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>99</td>
<td>4.5(.)</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>4.6(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-knifelight) (Knifelight surgery) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Cresswell,T. R., 2008</td>
<td>High Quality</td>
<td>Grip strength(Percentage of pre-op value)</td>
<td>3 months</td>
<td>CT release (open) (Standard limited open palmer release)</td>
<td>88</td>
<td>. %</td>
<td>CT release (mini-Indiana Tome) (Indiana Tome)</td>
<td>88</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Cresswell,T. R., 2008</td>
<td>High Quality</td>
<td>Pinch Strength(% improvement from baseline (units not reported))</td>
<td>3 months</td>
<td>CT release (open) (Standard limited open palmer release)</td>
<td>88</td>
<td>. %</td>
<td>CT release (mini-Indiana Tome) (Indiana Tome)</td>
<td>88</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Jugovac,I., 2002</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>3 months</td>
<td>CT release (open) (Traditional technique)</td>
<td>36</td>
<td>4.08(0.80)</td>
<td>CT release (mini-limited incision) (limited palmer incision)</td>
<td>36</td>
<td>4.12(0.90)</td>
<td>Mean Difference</td>
<td>-0.04(-0.43,0.353358)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Jugovac,I., 2002</td>
<td>High Quality</td>
<td>NCS (SNCV)(Sensory nerve conduction velocity (m/s))</td>
<td>3 months</td>
<td>CT release (open) (Traditional technique)</td>
<td>36</td>
<td>43.67(9.00)</td>
<td>CT release (mini-limited incision) (limited palmer incision)</td>
<td>36</td>
<td>41.86(8.50)</td>
<td>Mean Difference</td>
<td>1.81(-2.23,5.853943)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Treatment 2 (Details)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Larsen,M.B., 2013</td>
<td>High Quality</td>
<td>Grip strength(Percentage of contralateral hand)</td>
<td>3 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Grip strength (Percentage of contralateral hand)</td>
<td>5.5 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Outcome Details</td>
<td>Duration</td>
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<td>Group 1 N</td>
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<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High</td>
<td>Range of motion( )</td>
<td>3 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; 0.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
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<td>Effect Measure</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High</td>
<td>Range of motion( )</td>
<td>5.5 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>.%</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
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<tr>
<td>Suppaphol, S., 2012</td>
<td>High Quality</td>
<td>Grip strength (Pounds)</td>
<td>3 months</td>
<td>CT release (open) (Standard open carpal tunnel release)</td>
<td>15</td>
<td>55.67 (6.51)</td>
<td>CT release (mini) (Limited open carpal tunnel release direct vision and tunneling technique; 1.5 cm incision is made over the distal edge of transverse carpal ligament)</td>
<td>15</td>
<td>62.67 (5.62)</td>
<td>Mean Difference</td>
<td>-7 (-11.35, -2.64766)</td>
<td>CT release (mini) (Limited open carpal tunnel release direct vision and tunneling technique; 1.5 cm incision is made over the distal edge of transverse carpal ligament) (P-value &lt; .05)</td>
</tr>
<tr>
<td>Suppaphol, S., 2012</td>
<td>High Quality</td>
<td>Pinch Strength (Pounds)</td>
<td>3 months</td>
<td>CT release (open) (Standard open carpal tunnel release)</td>
<td>15</td>
<td>12.47 (1.5)</td>
<td>CT release (mini) (Limited open carpal tunnel release direct vision and tunneling technique; 1.5 cm incision is made over the distal edge of transverse carpal ligament)</td>
<td>15</td>
<td>13.6 (1.84)</td>
<td>Mean Difference</td>
<td>-1.13 (-2.35, 0.087526)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
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<tr>
<td>Suppaphol,S., 2012</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS)(Levine’s functional score)</td>
<td>3 months</td>
<td>CT release (open) (Standard open carpal tunnel release)</td>
<td>15</td>
<td>1.45(0.50)</td>
<td>CT release (mini) (Limited open carpal tunnel release direct vision and tunneling technique; 1.5 cm incision is made over the distal edge of transverse carpal ligament)</td>
<td>15</td>
<td>1.28(0.31)</td>
<td>Mean Difference</td>
<td>0.17(-0.13,0.467722)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Suppaphol,S., 2012</td>
<td>High Quality</td>
<td>Two-point discrimination(Millimeters)</td>
<td>3 months</td>
<td>CT release (open) (Standard open carpal tunnel release)</td>
<td>15</td>
<td>2.63(0.69)</td>
<td>CT release (mini) (Limited open carpal tunnel release direct vision and tunneling technique; 1.5 cm incision is made over the distal edge of transverse carpal ligament)</td>
<td>15</td>
<td>2.75(0.62)</td>
<td>Mean Difference</td>
<td>-0.12(-0.59,0.349446)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yucetas,S.C., 2013</td>
<td>High Quality</td>
<td>NCS (EMG)(Electromyographical motor latency (ms))</td>
<td>3 months</td>
<td>CT release (open) (Standard open CTR)</td>
<td>37</td>
<td>3.73(0.26)</td>
<td>CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)</td>
<td>38</td>
<td>3.67(0.30)</td>
<td>Mean Difference</td>
<td>0.06(-0.07,0.186953)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
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<tr>
<td>Yucetas,S.C., 2013</td>
<td>High Quality</td>
<td>NCS (EMG)(Electromyographical motor latency (ms))</td>
<td>5.9 months</td>
<td>CT release (open) (Standard open CTR)</td>
<td>CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)</td>
<td>37</td>
<td>3.75(0.26)</td>
<td>38</td>
<td>3.65(0.30)</td>
<td>Mean Difference</td>
<td>0.1(-0.03,0.226953)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yucetas,S.C., 2013</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale))</td>
<td>3 months</td>
<td>CT release (open) (Standard open CTR)</td>
<td>CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)</td>
<td>37</td>
<td>2.22(0.63)</td>
<td>38</td>
<td>2.15(0.56)</td>
<td>Mean Difference</td>
<td>0.07(-0.20,0.340022)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yucetas,S.C., 2013</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale))</td>
<td>5.9 months</td>
<td>CT release (open) (Standard open CTR)</td>
<td>CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)</td>
<td>37</td>
<td>2.22(0.62)</td>
<td>38</td>
<td>2.15(0.56)</td>
<td>Mean Difference</td>
<td>0.07(-0.20,0.337608)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Zyluk,A., 2006</td>
<td>High Quality</td>
<td>Grip strength(Kilograms)</td>
<td>3 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>33</td>
<td>. %</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-single incision) (Mini-open single incision release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Zyluk,A., 2006</td>
<td>High Quality</td>
<td>Grip strength(Kilograms)</td>
<td>5.9 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>33</td>
<td>. %</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-single incision) (Mini-open single incision release) (P-value&lt;.05)</td>
</tr>
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<tr>
<td>Zyluk,A., 2006</td>
<td>High</td>
<td>Grip strength(Kilograms)</td>
<td>11.8 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>. %</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-single incision) (Mini-open single incision release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Zyluk,A., 2006</td>
<td>High</td>
<td>Key pinch strength(Kilograms)</td>
<td>3 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>. %</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-single incision) (Mini-open single incision release) (P-value&lt;.05)</td>
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<tr>
<td>Zyluk,A., 2006</td>
<td>High</td>
<td>Key pinch strength(Kilograms)</td>
<td>5.9 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>. %</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
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<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Zyluk,A., 2006</td>
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<td>11.8 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
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<td>CT release (mini-single incision) (Mini-open single incision release)</td>
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<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
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<tr>
<td>Zyluk,A., 2006</td>
<td>High Quality</td>
<td>Pinch Strength (three-point pinch)(Kilograms)</td>
<td>3 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>. %</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-single incision) (Mini-open single incision release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Zyluk,A., 2006</td>
<td>High Quality</td>
<td>Pinch Strength (three-point pinch)(Kilograms)</td>
<td>5.9 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>. %</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-single incision) (Mini-open single incision release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Zyluk,A., 2006</td>
<td>High Quality</td>
<td>Pinch Strength (three-point pinch)(Kilograms)</td>
<td>11.8 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>. %</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Pinch Strength (two-point pinch)(Kilograms)</td>
<td>3 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>. %</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-single incision) (Mini-open single incision release) (P-value&lt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
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<td>Treatment 1 (Details)</td>
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<td>Effect Measure</td>
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<td>Zyluk, A., 2006</td>
<td>High Quality</td>
<td>Pinch Strength (two-point pinch) (Kilograms)</td>
<td>5.9 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>. %</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-single incision) (Mini-open single incision release) (P-value &lt; .05)</td>
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<tr>
<td>Zyluk, A., 2006</td>
<td>High Quality</td>
<td>Pinch Strength (two-point pinch) (Kilograms)</td>
<td>11.8 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>. %</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-single incision) (Mini-open single incision release) (P-value &lt; .05)</td>
</tr>
<tr>
<td>Zyluk, A., 2006</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS)</td>
<td>11.8 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>1.2(.)</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>1.2(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Zyluk, A., 2006</td>
<td>High Quality</td>
<td>Semmes Weinstein Monofilaments Test (SW test)</td>
<td>11.8 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>1.4(.)</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>1.3(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Reference Title</td>
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</tr>
<tr>
<td>Zyluk,A., 2006</td>
<td>High</td>
<td>Two-point discrimination(Millimeters)</td>
<td>11.8</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>1.3(,)</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>1.2(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate</td>
<td>Phalen's test score(% positive)</td>
<td>3.9</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
<td>13.89%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
<td>10.71%</td>
<td>RR</td>
<td>1.26(0.33,4.84)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate</td>
<td>Tinel's Sign/Test(# positive)</td>
<td>3.9</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
<td>19.44%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
<td>10.71%</td>
<td>RR</td>
<td>1.81(0.52,6.39)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Capa-Grasa,A., 2014</td>
<td>Moderate</td>
<td>Grip strength(Grip strength rate (units not reported))</td>
<td>3 months</td>
<td>CT release (mini-open) (Mini-OCTR respectively performed through a 1 mm or a 2 cm incision.)</td>
<td>20</td>
<td>86.17(5.50)</td>
<td>CT release (Ultra-minimally invasive) (Sonographically guided technique for ultra-minimally-invasive (Ultra-MIS) CT release 1 mm or cm incision)</td>
<td>20</td>
<td>87.22(4.76 )</td>
<td>Mean Difference</td>
<td>-1.05(-4.24,2.137866)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Capa-Grasa, A., 2014</td>
<td>Moderate Quality</td>
<td>Questionnaire (DASH-Quick DASH)</td>
<td>3 months</td>
<td>CT release (mini-open) (Mini-OCTR respectively performed through a 1 mm or a 2 cm incision.)</td>
<td>20</td>
<td>14.54(3.12)</td>
<td>CT release (Ultra-minimally invasive) (Sonographically guided technique for ultra-minimally-invasive (Ultra-MIS) CT release 1 mm or cm incision)</td>
<td>20</td>
<td>7.39(1.84)</td>
<td>Mean Difference</td>
<td>7.15(5.56,8.7374 79)</td>
<td>CT release (Ultra-minimally invasive) (Sonographically guided technique for ultra-minimally-invasive (Ultra-MIS) CT release 1 mm or cm incision) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Elsharif, M., 2014</td>
<td>Moderate Quality</td>
<td>Questionnaire (DASH-Quick DASH)</td>
<td>10 years</td>
<td>CT release (open) ()</td>
<td>.</td>
<td>34.1(23.27)</td>
<td>CT release (knifelight) ()</td>
<td>.</td>
<td>13.22(13.62)</td>
<td>Mean Difference</td>
<td>20.88(.,)</td>
<td>CT release (knifelight) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Faraj, A.A., 2012</td>
<td>Moderate Quality</td>
<td>NCS (DML) (Distal motor latency (ms))</td>
<td>3 months</td>
<td>CT release (open) (traditional open release)</td>
<td>20</td>
<td>4.08(0.80)</td>
<td>CT release (mini) (mini-transverse wrist incisions)</td>
<td>20</td>
<td>4.6(0.90)</td>
<td>Mean Difference</td>
<td>-0.52(-1.05,0.007746)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Faraj, A.A., 2012</td>
<td>Moderate Quality</td>
<td>NCS (SNCV) (Sensory nerve conduction velocity (m/s))</td>
<td>3 months</td>
<td>CT release (open) (traditional open release)</td>
<td>20</td>
<td>44.6(7.50)</td>
<td>CT release (mini) (mini-transverse wrist incisions)</td>
<td>20</td>
<td>42.52(8.70)</td>
<td>Mean Difference</td>
<td>2.08(-2.95,7.114186)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tarallo, M., 2014</td>
<td>Moderate Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>5.9 months</td>
<td>CT release (open) (Traditional)</td>
<td>60</td>
<td>2.3(0.60)</td>
<td>CT release (mini) (2 cm long incision)</td>
<td>60</td>
<td>1.4(0.40)</td>
<td>Mean Difference</td>
<td>0.9(0.72,1.08246 6)</td>
<td>CT release (mini) (2 cm long incision) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
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<tr>
<td>Tarallo,M., 2014</td>
<td>Moderate Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>11.8 months</td>
<td>CT release (open) (Traditional)</td>
<td>60</td>
<td>1.5(0.20)</td>
<td>CT release (mini) (2 cm long incision)</td>
<td>60</td>
<td>1.1(0.10)</td>
<td>Mean Difference</td>
<td>0.4(0.34,0.456580)</td>
<td>CT release (mini) (2 cm long incision) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Tarallo,M., 2014</td>
<td>Moderate Quality</td>
<td>Two-point discrimination (2PD)</td>
<td>11.8 months</td>
<td>CT release (open) (Traditional)</td>
<td>60</td>
<td>. %</td>
<td>CT release (mini) (2 cm long incision)</td>
<td>60</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ucar,B.Y., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (Boston-FSS) (Boston CTS Questionnaire (functional status scale))</td>
<td>2.5 years</td>
<td>CT release (Mini-incision distal to flexor crease (group 1)) (2cm longitudinal incision made distal to flexor crease)</td>
<td>45</td>
<td>2.16(0.68)</td>
<td>CT release (Mini-incision proximal to flexor crease (group 2)) (2cm longitudinal incision made proximal to flexor crease)</td>
<td>45</td>
<td>2.21(0.73)</td>
<td>Mean Difference</td>
<td>-0.05(-0.34,0.241492)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
### TABLE 150: PICO 7 PART 2 - MINI: OTHER

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellocco,P., 2005</td>
<td>High Quality</td>
<td>Patient satisfaction (general)(Patients satisfied results at final follow-up)</td>
<td>2.5 years</td>
<td>CT release (open-limited open) (limited open CTR)</td>
<td>123</td>
<td>74.80%</td>
<td>CT release (mini-open blind technique) (mini-open blind technique)</td>
<td>99</td>
<td>100.00%</td>
<td>RR</td>
<td>(. .)</td>
<td>CT release (mini-open blind technique) (mini-open blind technique) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Patient satisfaction (general)(Subjective satisfaction with their scar)</td>
<td>2.5 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>96</td>
<td>85.42%</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>77.78%</td>
<td>RR</td>
<td>1.10(0.96,1.26)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Patient satisfaction (general)(Subjective satisfaction with their scar)</td>
<td>4.9 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>95</td>
<td>85.26%</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>100.00%</td>
<td>RR</td>
<td>(. .)</td>
<td>CT release (mini-knifelight) (Knifelight surgery) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Faraj,A.A., 2012</td>
<td>Moderate Quality</td>
<td>Patient satisfaction (general)(Satisfaction of patients with postoperative symptomatic relieve: Good)</td>
<td>3 months</td>
<td>CT release (open) (traditional open release)</td>
<td>20</td>
<td>80.00%</td>
<td>CT release (mini) (mini-transverse wrist incisions)</td>
<td>20</td>
<td>60.00%</td>
<td>RR</td>
<td>1.33(0.88,2.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tarallo,M., 2014</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (Vancouver scale)(Patient satisfaction with scar - Good)</td>
<td>11.8 months</td>
<td>CT release (open) (Traditional)</td>
<td>60</td>
<td>30.00%</td>
<td>CT release (mini) (2 cm long incision)</td>
<td>60</td>
<td>53.33%</td>
<td>RR</td>
<td>0.56(0.36,0.89)</td>
<td>CT release (mini) (2 cm long incision) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Tarallo,M., 2014</td>
<td>Moderate</td>
<td>Questionnaire/Scale (Vancouver scale) (Patient satisfaction with scar - Satisfactory)</td>
<td>11.8 months</td>
<td>CT release (open) (Traditional)</td>
<td>60</td>
<td>36.67%</td>
<td>CT release (mini) (2 cm long incision)</td>
<td>60</td>
<td>3.33%</td>
<td>RR</td>
<td>11.00(2.71,44.72)</td>
<td>CT release (mini) (2 cm long incision) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Tarallo,M., 2014</td>
<td>Moderate</td>
<td>Questionnaire/Scale (Vancouver scale) (Patient satisfaction with scar - Unsatisfactory)</td>
<td>11.8 months</td>
<td>CT release (open) (Traditional)</td>
<td>60</td>
<td>26.67%</td>
<td>CT release (mini) (2 cm long incision)</td>
<td>60</td>
<td>3.33%</td>
<td>RR</td>
<td>8.00(1.92,33.29)</td>
<td>CT release (mini) (2 cm long incision) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Tarallo,M., 2014</td>
<td>Moderate</td>
<td>Questionnaire/Scale (Vancouver scale) (Patient satisfaction with scar - Very good)</td>
<td>11.8 months</td>
<td>CT release (open) (Traditional)</td>
<td>60</td>
<td>6.67%</td>
<td>CT release (mini) (2 cm long incision)</td>
<td>60</td>
<td>40.00%</td>
<td>RR</td>
<td>0.17(0.06,0.45)</td>
<td>CT release (mini) (2 cm long incision) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Cresswell,T.R., 2008</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(visual analogue scale of 0 to 10)</td>
<td>3 months</td>
<td>CT release (open) (Standard limited open palmer release)</td>
<td>88</td>
<td>2(0)</td>
<td>CT release (mini-Indiana Tome) (Indiana Tome)</td>
<td>88</td>
<td>1.9(0)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Larsen,M.B., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>3 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>.%</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Larsen,M.B., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>5.5 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yucetas,S.C., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>3 months</td>
<td>CT release (open) (Standard open CTR)</td>
<td>37</td>
<td>3.35(1.74)</td>
<td>CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)</td>
<td>38</td>
<td>3.11(1.80)</td>
<td>Mean Difference</td>
<td>0.24(-0.56,1.041182)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Yucetas,S.C., 2013</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain) ( )</td>
<td>5.9 months</td>
<td>CT release (open) (Standard open CTR)</td>
<td>37</td>
<td>3.16 (1.48)</td>
<td>CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)</td>
<td>38</td>
<td>2.84 (1.53)</td>
<td>Mean Difference</td>
<td>0.32 (-0.36, 1.001230)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general) (Night pain)</td>
<td>3.9 months</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
<td>0.00%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00 (0.00, 0.00)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general) (Wrist pain)</td>
<td>3.9 months</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
<td>0.00%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
<td>14.29%</td>
<td>RD</td>
<td>-0.14 (-0.27, -0.01)</td>
<td>CT release (open) (large open incision) (P-value &lt;.05)</td>
</tr>
</tbody>
</table>

- **Reference Title**: Yucetas,S.C., 2013
- **Quality**: High Quality
- **Outcome Details**: Questionnaire/Scale (VAS-pain) ( )
- **Duration**: 5.9 months
- **Treatment 1 (Details)**: CT release (open) (Standard open CTR)
- **Group1 N**: 37
- **Mean1/P1 (SD1)**: 3.16 (1.48)
- **Treatment 2 (Details)**: CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)
- **Group2 N**: 38
- **Mean2/P2 (SD2)**: 2.84 (1.53)
- **Effect Measure**: Mean Difference
- **Result (95% CI)**: 0.32 (-0.36, 1.001230)
- **Favored Treatment**: Not Significant (P-value >.05)

- **Reference Title**: Aslani,H.R., 2012
- **Quality**: Moderate Quality
- **Outcome Details**: Symptom recurrence (general) (Night pain)
- **Duration**: 3.9 months
- **Treatment 1 (Details)**: CT release (open) (large open incision)
- **Group1 N**: 36
- **Mean1/P1**: 0.00%
- **Treatment 2 (Details)**: CT release (mini) (Mini palmer incision)
- **Group2 N**: 28
- **Mean2/P2**: 0.00%
- **Effect Measure**: RD
- **Result (95% CI)**: 0.00 (0.00, 0.00)
- **Favored Treatment**: Not Significant (P-value >.05)

- **Reference Title**: Aslani,H.R., 2012
- **Quality**: Moderate Quality
- **Outcome Details**: Symptom recurrence (general) (Wrist pain)
- **Duration**: 3.9 months
- **Treatment 1 (Details)**: CT release (open) (large open incision)
- **Group1 N**: 36
- **Mean1/P1**: 0.00%
- **Treatment 2 (Details)**: CT release (mini) (Mini palmer incision)
- **Group2 N**: 28
- **Mean2/P2**: 14.29%
- **Effect Measure**: RD
- **Result (95% CI)**: -0.14 (-0.27, -0.01)
- **Favored Treatment**: CT release (open) (large open incision) (P-value <.05)
### TABLE 152: PICO 7 PART 2- MINI: QUALITY OF LIFE

<table>
<thead>
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<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellocco, P., 2009</td>
<td>High Quality</td>
<td>Return to Work( )</td>
<td>4.9 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>.</td>
<td>. %</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-knifelight) (Knifelight surgery) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Jugovac, I., 2002</td>
<td>High Quality</td>
<td>Return to Normal Activities(Return to daily activities days)</td>
<td>3 months</td>
<td>CT release (open) (Traditional technique)</td>
<td>36</td>
<td>86.11%</td>
<td>CT release (mini-limited incision) (limited palmar incision)</td>
<td>36</td>
<td>. %</td>
<td>RR</td>
<td>.(..)</td>
<td>CT release (open) (Traditional technique) (P-value&lt;.05)</td>
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<tr>
<td>Jugovac, I., 2002</td>
<td>High Quality</td>
<td>Return to Work(Return to work days)</td>
<td>3 months</td>
<td>CT release (open) (Traditional technique)</td>
<td>36</td>
<td>. %</td>
<td>CT release (mini-limited incision) (limited palmar incision)</td>
<td>36</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-limited incision) (limited palmar incision) (P-value&lt;.05)</td>
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<tr>
<td>Faraj, A.A., 2012</td>
<td>Moderate Quality</td>
<td>Return to Normal Activities(Days)</td>
<td>3 months</td>
<td>CT release (open) (traditional open release)</td>
<td>20</td>
<td>12.55(4.03)</td>
<td>CT release (mini) (mini-transverse wrist incisions)</td>
<td>20</td>
<td>3.95(1.82)</td>
<td>Mean Difference</td>
<td>8.6(6.66,10.53798)</td>
<td>CT release (mini) (mini-transverse wrist incisions) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Cellocco,P., 2005</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale)-Italian modified version)</td>
<td>1.6 years</td>
<td>CT release (open-limited open) (limited open CTR)</td>
<td>123</td>
<td>2.04(,)</td>
<td>CT release (mini-open blind technique) (mini-open blind technique)</td>
<td>99</td>
<td>1.46(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-open blind technique) (mini-open blind technique) (P-value&lt;.05)</td>
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<tr>
<td>Cellocco,P., 2005</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale)-Italian modified version)</td>
<td>2.5 years</td>
<td>CT release (open-limited open) (limited open CTR)</td>
<td>123</td>
<td>1.39(,)</td>
<td>CT release (mini-open blind technique) (mini-open blind technique)</td>
<td>99</td>
<td>1.28(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale)-Italian modified version)</td>
<td>1.6 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>123</td>
<td>2.54(0.88)</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>2.02(0.82)</td>
<td>MeanDifference</td>
<td>0.52(0.30,0.744228 )</td>
<td>CT release (mini-knifelight) (Knifelight surgery) (P-value&lt;.05)</td>
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<tr>
<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale)-Italian modified version)</td>
<td>2.5 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>123</td>
<td>1.73(0.83)</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>1.88(0.75)</td>
<td>MeanDifference</td>
<td>-0.15(-0.36,0.058190)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale)-Italian modified version)</td>
<td>4.9 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>123</td>
<td>1.75(0.97)</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>1.8(0.78)</td>
<td>Mean Difference</td>
<td>-0.05(-0.28,0.180206)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Cellocco,P., 2009</td>
<td>High Quality</td>
<td>Symptom recurrence (general)(Recurrent CTS)</td>
<td>4.9 years</td>
<td>CT release (open) (3-4cm long limited-open palmar incision)</td>
<td>123</td>
<td>3.25%</td>
<td>CT release (mini-knifelight) (Knifelight surgery)</td>
<td>99</td>
<td>6.06%</td>
<td>RR</td>
<td>0.54(0.16,1.85)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Cresswell,T.R., 2008</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)()</td>
<td>3 months</td>
<td>CT release (open) (Standard limited open palmer release)</td>
<td>88</td>
<td>17.1(.)</td>
<td>CT release (mini-Indiana Tome) (Indiana Tome)</td>
<td>88</td>
<td>18.5(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Cresswell,T.R., 2008</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)()</td>
<td>7 years</td>
<td>CT release (open) (Standard limited open palmer release)</td>
<td>62</td>
<td>13(.)</td>
<td>CT release (mini-Indiana Tome) (Indiana Tome)</td>
<td>53</td>
<td>16(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (mini-Indiana Tome) (Indiana Tome) (P-value&lt;.05)</td>
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<tr>
<td>Jugovac,I., 2002</td>
<td>High Quality</td>
<td>Symptom relief (general)(Complete symptomatic relief after the procedure)</td>
<td>3 months</td>
<td>CT release (open) (Traditional technique)</td>
<td>36</td>
<td>86.11%</td>
<td>CT release (mini-limited incision) (limited palmer incision)</td>
<td>36</td>
<td>86.11%</td>
<td>RR</td>
<td>1.00(0.83,1.20)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Larsen,M.B., 2013</td>
<td>High Quality</td>
<td>Paresthesia(Paresthesia (VAS scale))</td>
<td>3 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissor dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Larsen, M.B., 2013</td>
<td>High Quality</td>
<td>Paresthesia (Paresthesia (VAS scale))</td>
<td>5.5 months</td>
<td>CT release (open) (7 cm curved incision just ulnar to the thenar crease and angulated over the flexion crease of the wrist in order to release the flexor retinaculum and antebrachial fascia under direct vision)</td>
<td>30</td>
<td>. %</td>
<td>CT release (mini) (Short incision: an incision of 3 cm in the mid-palm distal to the flexion crease of the wrist in order to release the distal portion of the flexor retinaculum under direct vision, and the proximal portion of the flexor retinaculum and antebrachial fascia were then carefully divided using scissors dissection in a plane deep to subcutaneous fat and skin)</td>
<td>30</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Suppaphol, S., 2012</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)(Levine’s symptom severity score)</td>
<td>3 months</td>
<td>CT release (open) (Standard open carpal tunnel release)</td>
<td>15</td>
<td>1.23(0.50)</td>
<td>CT release (mini) (Limited open carpal tunnel release direct vision and tunneling technique; 1.5 cm incision is made over the distal edge of transverse carpal ligament)</td>
<td>15</td>
<td>1.17(0.17)</td>
<td>Mean Difference</td>
<td>0.06(-0.21,0.327260)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Yucetas, S.C., 2013</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>3 months</td>
<td>CT release (open) (Standard open CTR)</td>
<td>37</td>
<td>1.89(0.33)</td>
<td>CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)</td>
<td>38</td>
<td>1.95(0.42)</td>
<td>Mean Difference</td>
<td>-0.06(-0.23,0.110704)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Yucetas, S.C., 2013</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>5.9 months</td>
<td>CT release (open) (Standard open CTR)</td>
<td>37</td>
<td>1.87(0.35)</td>
<td>CT release (mini-open KnifeLight) (mini open KnifeLight instrument assisted)</td>
<td>38</td>
<td>1.95(0.41)</td>
<td>Mean Difference</td>
<td>-0.08(-0.25,0.092374)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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<td>Zyluk,A., 2006</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)</td>
<td>11.8 months</td>
<td>CT release (mini-double incision) (Mini-open double incision release)</td>
<td>33</td>
<td>1.2(,)</td>
<td>CT release (mini-single incision) (Mini-open single incision release)</td>
<td>40</td>
<td>1.1(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general) (Stiffness)</td>
<td>3.9 months</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
<td>5.56%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
<td>0.00%</td>
<td>RD</td>
<td>0.06(-0.02,0.13)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general) (Weakness)</td>
<td>3.9 months</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
<td>11.11%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
<td>0.00%</td>
<td>RD</td>
<td>0.11(0.01,0.21)</td>
<td>CT release (mini) (Mini palmer incision) (P-value&lt;.05)</td>
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<tr>
<td>Aslani,H.R., 2012</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (numbness) (Numbness)</td>
<td>3.9 months</td>
<td>CT release (open) (large open incision)</td>
<td>36</td>
<td>0.00%</td>
<td>CT release (mini) (Mini palmer incision)</td>
<td>28</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Tarallo,M., 2014</td>
<td>Moderate Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>5.9 months</td>
<td>CT release (open) (Traditional)</td>
<td>60</td>
<td>2.7(0.60)</td>
<td>CT release (mini) (2 cm long incision)</td>
<td>60</td>
<td>1.4(0.30)</td>
<td>Mean Difference</td>
<td>1.3(1.13,1.469740)</td>
<td>CT release (mini) (2 cm long incision) (P-value&lt;.05)</td>
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<td>Tarallo,M., 2014</td>
<td>Moderate Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>11.8 months</td>
<td>CT release (open) (Traditional)</td>
<td>60</td>
<td>1.6(0.40)</td>
<td>CT release (mini) (2 cm long incision)</td>
<td>60</td>
<td>1.1(0.10)</td>
<td>Mean Difference</td>
<td>0.5(0.40,0.604328)</td>
<td>CT release (mini) (2 cm long incision) (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Mean1/P 1 (SD1)</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Ucar.B.Y., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>2.5 years</td>
<td>CT release (Mini-incision distal to flexor crease (group 1)) (2cm longitudinal incision made distal to flexor crease)</td>
<td>CT release (Mini-incision proximal to flexor crease (group 2)) (2cm longitudinal incision made proximal to flexor crease)</td>
<td>45</td>
<td>2.42(0.75)</td>
<td>2.66(0.74)</td>
<td>Mean Difference</td>
<td>-0.24(-0.55,0.067844)</td>
<td>Not Significant (P-value&gt;.05)</td>
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### TABLE 154: PICO 7 PART 3- OPEN: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Treatment 2 (Details)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favorable Treatment</th>
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<tbody>
<tr>
<td>Castillo,T.N., 2014</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain)( )</td>
<td>5.9 months</td>
<td>CT release (open-single incision) (Open single incision CTR)</td>
<td>CT release (open-double incision) (Two-incision CTR)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Castillo,T.N., 2014</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain)( )</td>
<td>5.9 months</td>
<td>CT release (open-double incision) (Two-incision CTR)</td>
<td>CT release (open-single incision) (Open single incision CTR)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Castillo,T.N., 2014</td>
<td>High Quality</td>
<td>Symptom occurrence (scar tenderness)( )</td>
<td>5.9 months</td>
<td>CT release (open-single incision) (Open single incision CTR)</td>
<td>CT release (open-double incision) (Two-incision CTR)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Castillo,T.N., 2014</td>
<td>High Quality</td>
<td>Symptom occurrence (scar tenderness)( )</td>
<td>5.9 months</td>
<td>CT release (open-double incision) (Two-incision CTR)</td>
<td>CT release (open-single incision) (Open single incision CTR)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Hamed,A.R., 2009</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain)( )</td>
<td>3 months</td>
<td>CT release (open-double incision) (Open double-incision technique)</td>
<td>CT release (open-single incision) (Standard single-incision technique)</td>
<td>RR</td>
<td>0.37(0.14,0.95)</td>
<td>CT release (open-double incision) (Open double-incision technique) (P-value&lt;.05)</td>
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<tr>
<td>Hamed,A.R., 2009</td>
<td>High Quality</td>
<td>Symptom occurrence (pillar pain)( )</td>
<td>5.9 months</td>
<td>CT release (open-double incision) (Open double-incision technique)</td>
<td>CT release (open-single incision) (Standard single-incision technique)</td>
<td>RR</td>
<td>0.14(0.02,1.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<tr>
<td>Hamed,A.R., 2009</td>
<td>High Quality</td>
<td>Symptom occurrence (scar tenderness)</td>
<td>3 months</td>
<td>CT release (open-double incision) (Open double-incision technique)</td>
<td>19</td>
<td>10.53%</td>
<td>CT release (open-single incision) (Standard single-incision technique)</td>
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<td>High Quality</td>
<td>Symptom occurrence (scar tenderness)</td>
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<td>CT release (open-double incision) (Open double-incision technique)</td>
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<td>High Quality</td>
<td>Questionnaire (DASH)( )</td>
<td>5.9 months</td>
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<td>11</td>
<td>13.5(22.46)</td>
<td>CT release (open-single incision) (Open single incision CTR)</td>
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<td>Reference Title</td>
<td>Quality</td>
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<td>Mean1/P1 (SD1)</td>
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<tr>
<td>Castillo,T.N., 2014</td>
<td>High Quality</td>
<td>Grip strength(Pounds)</td>
<td>5.9 months</td>
<td>CT release (open-double incision) (Two-incision CTR)</td>
<td>11</td>
<td>43.6(14.15)</td>
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<td>Castillo,T.N., 2014</td>
<td>High Quality</td>
<td>Pinch Strength(Pounds)</td>
<td>5.9 months</td>
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<td>11</td>
<td>16.6(3.27)</td>
<td>CT release (open-single incision) (Open single incision CTR)</td>
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<td>Questionnaire (BWCTQ-FSS)( )</td>
<td>5.9 months</td>
<td>CT release (open-double incision) (Two-incision CTR)</td>
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<td>1.6(0.87)</td>
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<td>Hamed,A.R., 2009</td>
<td>High Quality</td>
<td>Grip strength(Pounds)</td>
<td>3 months</td>
<td>CT release (open-double incision) (Open double-incision technique)</td>
<td>19</td>
<td>65(12.00)</td>
<td>CT release (open-single incision) (Standard single-incision technique)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
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<td>Mean1/P1 (SD1)</td>
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<td>Hamed, A.R., 2009</td>
<td>High Quality</td>
<td>Grip strength (Pounds)</td>
<td>5.9 months</td>
<td>CT release (open-double incision) (Open double-incision technique)</td>
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<td>70 (16.00)</td>
<td>CT release (open-single incision) (Standard single-incision technique)</td>
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### TABLE 157: PICO 7 PART 3- OPEN: SYMPTOMS

<table>
<thead>
<tr>
<th>Reference Title</th>
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<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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</thead>
<tbody>
<tr>
<td>Castillo,T.N., 2014</td>
<td>High Quality</td>
<td>Questionnaire (BWCTQ-SSS)( )</td>
<td>5.9 months</td>
<td>CT release (open-double incision) (Two-incision CTR)</td>
<td>11</td>
<td>CT release (open-single incision) (Open single incision CTR)</td>
<td>13</td>
<td>1.33(0.53)</td>
<td>1.33(0.36)</td>
<td>Mean Difference</td>
<td>0(-0.37,0.369321)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
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<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Complications (general)(Discomfort caused by splint)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>0.00%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>7.59%</td>
<td>RD</td>
<td>-0.08(-0.13,-0.02)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Complications (general)(Overall)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>85.29%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>58.23%</td>
<td>RR</td>
<td>1.46(1.19,1.81)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks) (P-value&lt;.05)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Complications (general)(Reflex sympathetic dystrophy)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>1.47%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>0.00%</td>
<td>RD</td>
<td>0.01(-0.01,0.04)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Complications (general)(Scar pain)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>77.94%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>25.32%</td>
<td>RR</td>
<td>3.08(2.07,4.59)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks) (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Complications (general)(skin irritation)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>27.94%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>10.13%</td>
<td>RR</td>
<td>2.76(1.29,5.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks) (P-value&lt;.05)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Complications (general)(stiffness of wrist, hands, or fingers)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>35.29%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>39.24%</td>
<td>RR</td>
<td>0.90(0.59,1.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Complications (general)(Swelling of the wrist, hand or fingers)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>0.00%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>5.06%</td>
<td>RD</td>
<td>-0.05(-0.10,-0.00)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Complications (hematoma)(wound hematoma)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>14.71%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>1.27%</td>
<td>RR</td>
<td>11.62(1.53,88.45)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks) (P-value&lt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Complications (infection)(wound infection)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
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<td>7.35%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
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<td>2.53%</td>
<td>RR</td>
<td>2.90(0.58,14.49)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Surgery Failure(Success Rate)</td>
<td>3 months</td>
<td>Open CTR (traditional open release)</td>
<td>78</td>
<td>79.49%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>86</td>
<td>53.49%</td>
<td>RR</td>
<td>1.49(1.18,1.86)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Surgery Failure(Success Rate)</td>
<td>5.9 months</td>
<td>Open CTR (traditional open release)</td>
<td>77</td>
<td>93.51%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>84</td>
<td>67.86%</td>
<td>RR</td>
<td>1.38(1.18,1.61)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Surgery Failure(Success Rate)</td>
<td>11.8 months</td>
<td>Open CTR (traditional open release)</td>
<td>73</td>
<td>91.78%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>83</td>
<td>72.29%</td>
<td>RR</td>
<td>1.27(1.09,1.47)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<td>Gerritsen,A.A., 2002</td>
<td>High Quality</td>
<td>Surgery Failure(Success Rate)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>89.71%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
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<td>74.68%</td>
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<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
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<td>Favored Treatment</td>
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<tr>
<td>Gerritsen,A.A., 2002</td>
<td>High</td>
<td>Symptom occurrence (pillar pain)(severe pillar pain)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>2.94%</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>0.00%</td>
<td>RD</td>
<td>0.03(-0.01,0.07)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ly,Pen D., 2005</td>
<td>Moderate</td>
<td>Treatment Failure(&lt;20% VAS score improvement @ 3 months or worsening of symptoms)</td>
<td>3 months</td>
<td>CT release (mini) (Limited palmar incision technique)</td>
<td>69</td>
<td>2.90%</td>
<td>Steroid (injection) (22-gauge needle used)</td>
<td>82</td>
<td>1.22%</td>
<td>RR</td>
<td>2.38(0.22,25.66)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ly,Pen D., 2005</td>
<td>Moderate</td>
<td>Treatment Failure(&lt;20% VAS score improvement @ 3 months or worsening of symptoms)</td>
<td>5.9 months</td>
<td>CT release (mini) (Limited palmar incision technique)</td>
<td>67</td>
<td>4.48%</td>
<td>Steroid (injection) (22-gauge needle used)</td>
<td>80</td>
<td>3.75%</td>
<td>RR</td>
<td>1.19(0.25,5.72)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ly,Pen D., 2005</td>
<td>Moderate</td>
<td>Treatment Failure(&lt;20% VAS score improvement @ 3 months or worsening of symptoms)</td>
<td>11.8 months</td>
<td>CT release (mini) (Limited palmar incision technique)</td>
<td>63</td>
<td>3.17%</td>
<td>Steroid (injection) (22-gauge needle used)</td>
<td>77</td>
<td>10.39%</td>
<td>RR</td>
<td>0.31(0.07,1.39)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1/P1 (SD1)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Jarvik,J.G., 2009</td>
<td>High Quality</td>
<td>Questionnaire (SF-36)(MCS)</td>
<td>5.9 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>50</td>
<td>47(16.00)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>54</td>
<td>47(14.00)</td>
<td>Mean Difference</td>
<td>0(-5.80,5.797635)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Questionnaire (SF-36)(PCS)</td>
<td>5.9 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>50</td>
<td>39(12.00)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>54</td>
<td>47(14.00)</td>
<td>Mean Difference</td>
<td>-8(-13.00,-2.99926)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks) (P-value&lt;.05)</td>
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<tr>
<td>Jarvik,J.G., 2009</td>
<td>High Quality</td>
<td>Questionnaire (SF-36)(MCS)</td>
<td>11.8 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>49</td>
<td>45(15.00)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>52</td>
<td>47(15.00)</td>
<td>Mean Difference</td>
<td>-2(-7.85,3.853401)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Jarvik,J.G., 2009</td>
<td>High Quality</td>
<td>Questionnaire (SF-36)(PCS)</td>
<td>11.8 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
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<td>39(14.00)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
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<td>37(12.00)</td>
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<td>Gerritsen,A .A., 2002</td>
<td>High Quality</td>
<td>NCS (DSL)( )</td>
<td>11.8 months</td>
<td>Open CTR (traditional open release)</td>
<td>56</td>
<td>1(1.00)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>59</td>
<td>0.7(0.80)</td>
<td>Mean Difference</td>
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<td>Gerritsen,A .A., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS)(Functional status scale)</td>
<td>3 months</td>
<td>Open CTR (traditional open release)</td>
<td>78</td>
<td>0.6(0.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>86</td>
<td>0.4(0.70)</td>
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<td>Gerritsen,A .A., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS)(Functional status scale)</td>
<td>5.9 months</td>
<td>Open CTR (traditional open release)</td>
<td>77</td>
<td>1(0.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>84</td>
<td>0.5(0.80)</td>
<td>Mean Difference</td>
<td>0.5(0.24,0.763971)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<td>11.8 months</td>
<td>Open CTR (traditional open release)</td>
<td>73</td>
<td>1(0.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
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<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<td>Questionnaire (Levine-FSS)(Functional status scale)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>0.9(0.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
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<td>0.7(0.80)</td>
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<td>Outcome Details</td>
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<td>Effect Measure</td>
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<tr>
<td>Hui,A.C., 2005</td>
<td>High Quality</td>
<td>Grip strength(Kilograms)</td>
<td>4.6 months</td>
<td>CT release (open) (traditional open release)</td>
<td>25</td>
<td>21.8(7.90)</td>
<td>No surgery (steroid injection) (15 mg of methylprednisolone acetate injected into carpal tunnel)</td>
<td>25</td>
<td>26.6(7.40)</td>
<td>Mean Difference</td>
<td>-4.8(-9.04,-0.55679)</td>
<td>No surgery (steroid injection) (15 mg of methylprednisolone acetate injected into carpal tunnel) (P-value&lt;.05)</td>
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<tr>
<td>Hui,A.C., 2005</td>
<td>High Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>4.6 months</td>
<td>CT release (open) (traditional open release)</td>
<td>25</td>
<td>4.2(0.90)</td>
<td>No surgery (steroid injection) (15 mg of methylprednisolone acetate injected into carpal tunnel)</td>
<td>25</td>
<td>4.4(0.90)</td>
<td>Mean Difference</td>
<td>-0.2(-0.70,0.298934)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Hui,A.C., 2005</td>
<td>High Quality</td>
<td>NCS (SNCV)(Sensory nerve conduction velocity (m/s))</td>
<td>4.6 months</td>
<td>CT release (open) (traditional open release)</td>
<td>25</td>
<td>42.2(8.00)</td>
<td>No surgery (steroid injection) (15 mg of methylprednisolone acetate injected into carpal tunnel)</td>
<td>25</td>
<td>40.5(6.30)</td>
<td>Mean Difference</td>
<td>1.7(-2.29,5.691668)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Jarvik,J.G., 2009</td>
<td>High Quality</td>
<td>Questionnaire (CTSAQ)(Function(1-5))</td>
<td>5.9 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>50</td>
<td>1.91(0.88)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>54</td>
<td>2.44(0.87)</td>
<td>Mean Difference</td>
<td>-0.53(-0.87,-0.19333)</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference) (P-value&lt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Treatment 2 (Details)</td>
<td>Group2</td>
<td>Effect Measure</td>
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<tr>
<td>Jarvik, J.G., 2009</td>
<td>High Quality</td>
<td>Questionnaire (CTSAQ)(Function(1-5))</td>
<td>11.8 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>49</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>52</td>
<td>Mean Difference</td>
<td>-0.43(-0.77,-0.08792)</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference) (P-value&lt;.05)</td>
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<tr>
<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>NCS (Motor amplitude)</td>
<td>11.8 months</td>
<td>CT release (open) ( )</td>
<td>45</td>
<td>No surgery (steroid injection) ( )</td>
<td>50</td>
<td>Mean Difference</td>
<td>-1.69(-4.58,1.198442)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>NCS (DML)( )</td>
<td>11.8 months</td>
<td>CT release (open) ( )</td>
<td>45</td>
<td>No surgery (steroid injection) ( )</td>
<td>50</td>
<td>Mean Difference</td>
<td>-0.65(-1.25,-0.05120)</td>
<td>CT release (open) (P-value&lt;.05)</td>
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<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>NCS (SA)( )</td>
<td>11.8 months</td>
<td>CT release (open) ( )</td>
<td>45</td>
<td>No surgery (steroid injection) ( )</td>
<td>50</td>
<td>Mean Difference</td>
<td>3.56(-3.73,10.85236)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>NCS (SNCV)( )</td>
<td>11.8 months</td>
<td>CT release (open) ( )</td>
<td>45</td>
<td>No surgery (steroid injection) ( )</td>
<td>50</td>
<td>Mean Difference</td>
<td>6.84(2.89,10.78620)</td>
<td>No surgery (steroid injection) (P-value&lt;.05)</td>
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<tr>
<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Visual analog scale of functional impairment (100cm VAS))</td>
<td>3 months</td>
<td>CT release (open) ( )</td>
<td>67</td>
<td>No surgery (steroid injection) ( )</td>
<td>80</td>
<td>Mean Difference</td>
<td>11(4.80,17.20054)</td>
<td>No surgery (steroid injection) (P-value&lt;.05)</td>
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<tr>
<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Visual analog scale of functional impairment (100cm VAS))</td>
<td>5.9 months</td>
<td>CT release (open) ( )</td>
<td>63</td>
<td>No surgery (steroid injection) ( )</td>
<td>77</td>
<td>Mean Difference</td>
<td>-1(-5.99,3.994542)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Visual analog scale of functional impairment (100cm VAS))</td>
<td>11.8 months</td>
<td>CT release (open) ( )</td>
<td>45</td>
<td>3(11.00)</td>
<td>No surgery (steroid injection) ( )</td>
<td>50</td>
<td>9(15.00)</td>
<td>Mean Difference</td>
<td>-6(-11.26, -0.74482)</td>
<td>CT release (open) (P-value&lt;.05)</td>
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<tr>
<td>Ly-Pen, D., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Reached 20% improvement in functional impairment on 100mm VAS scale)</td>
<td>2 years</td>
<td>CT release (mini) (limited palmar incision)</td>
<td>80</td>
<td>65.00%</td>
<td>No surgery (Steroid injection) (paramethasone acetonide, 20mg in 1 ml)</td>
<td>83</td>
<td>53.01%</td>
<td>RR</td>
<td>1.23(0.95,1.59)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Ly-Pen, D., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Reached 50% improvement in functional impairment on 100mm VAS scale)</td>
<td>2 years</td>
<td>CT release (mini) (limited palmar incision)</td>
<td>80</td>
<td>63.75%</td>
<td>No surgery (Steroid injection) (paramethasone acetonide, 20mg in 1 ml)</td>
<td>60</td>
<td>53.33%</td>
<td>RR</td>
<td>1.20(0.90,1.60)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ly-Pen, D., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Reached 70% improvement in functional impairment on 100mm VAS scale)</td>
<td>2 years</td>
<td>CT release (mini) (limited palmar incision)</td>
<td>80</td>
<td>60.00%</td>
<td>No surgery (Steroid injection) (paramethasone acetonide, 20mg in 1 ml)</td>
<td>83</td>
<td>44.58%</td>
<td>RR</td>
<td>1.35(1.00,1.82)</td>
<td>Not Significant (P-value&gt;.05)</td>
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TABLE 161: PICO 7 PART 4- SURGICAL VERSUS CONSERVATIVE: PAIN

<table>
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<th>Reference Title</th>
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<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
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<tbody>
<tr>
<td>Gerritsen, A.A., 2002</td>
<td>High Quality</td>
<td>Symptom recurrence (nocturnal pain) (Number of nights waking up due to symptoms)</td>
<td>3 months</td>
<td>Open CTR (traditional open release)</td>
<td>78</td>
<td>2.6(3.50)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>86</td>
<td>2.2(3.10)</td>
<td>Mean Difference</td>
<td>0.4(-0.62,1.416171)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gerritsen, A.A., 2002</td>
<td>High Quality</td>
<td>Symptom recurrence (nocturnal pain) (Number of nights waking up due to symptoms)</td>
<td>5.9 months</td>
<td>Open CTR (traditional open release)</td>
<td>77</td>
<td>3.6(2.80)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>84</td>
<td>2.6(3.10)</td>
<td>Mean Difference</td>
<td>1(0.09,1.911395)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<tr>
<td>Gerritsen, A.A., 2002</td>
<td>High Quality</td>
<td>Symptom recurrence (nocturnal pain) (Number of nights waking up due to symptoms)</td>
<td>11.8 months</td>
<td>Open CTR (traditional open release)</td>
<td>73</td>
<td>3.6(2.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>83</td>
<td>2.9(3.00)</td>
<td>Mean Difference</td>
<td>0.7(-0.23,1.626893)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Gerritsen, A.A., 2002</td>
<td>High Quality</td>
<td>Symptom recurrence (nocturnal pain) (Number of nights waking up due to symptoms)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>3.6(2.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>3.2(3.10)</td>
<td>Mean Difference</td>
<td>0.4(-0.57,1.370787)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Jarvik, J.G., 2009</td>
<td>High Quality</td>
<td>Symptom recurrence (pain) (Pain intensity(1-10))</td>
<td>5.9 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>50</td>
<td>4.7(3.20)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>54</td>
<td>5.7(3.10)</td>
<td>Mean Difference</td>
<td>-1(-2.21,0.212609)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
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<td>Effect Measure</td>
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<tr>
<td>Jarvik,J.G., 2009</td>
<td>High Quality</td>
<td>Symptom recurrence (pain)(Pain interference(1-10))</td>
<td>5.9 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>50</td>
<td>2.8(3.00)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>54</td>
<td>3.4(3.20)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Jarvik,J.G., 2009</td>
<td>High Quality</td>
<td>Symptom recurrence (pain)(Pain intensity(1-10))</td>
<td>11.8 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>49</td>
<td>3.5(3.00)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>52</td>
<td>4.3(3.30)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Symptom recurrence (pain)(Pain interference(1-10))</td>
<td>11.8 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>49</td>
<td>2.1(6.90)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>52</td>
<td>3.1(3.30)</td>
<td>Mean Difference</td>
<td>-1(-3.13,1.130057)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Andreu,J.L., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain)(100cm)</td>
<td>3 months</td>
<td>CT release (open)</td>
<td>67</td>
<td>15(22.00)</td>
<td>No surgery (steroid injection)</td>
<td>80</td>
<td>6(15.00)</td>
<td>Mean Difference</td>
<td>9(2.79,15.20932)</td>
<td>No surgery (steroid injection) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Andreu,J.L., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain)(100cm)</td>
<td>5.9 months</td>
<td>CT release (open) ( )</td>
<td>63</td>
<td>5(16.00)</td>
<td>No surgery (steroid injection) ( )</td>
<td>77</td>
<td>8(18.00)</td>
<td>Mean Difference</td>
<td>-3(-8.64,2.636928)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Andreu,J.L., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain)(100cm)</td>
<td>11.8 months</td>
<td>CT release (open) ( )</td>
<td>45</td>
<td>2(10.00)</td>
<td>No surgery (steroid injection) ( )</td>
<td>50</td>
<td>8(15.00)</td>
<td>Mean Difference</td>
<td>-6(-11.08,-0.91825)</td>
<td>CT release (open) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ly-Pen,D., 2012</td>
<td>Moderate Quality</td>
<td>Symptom relief (pain)(Reached 20% improvement in pain on VAS 100mm scale)</td>
<td>2 years</td>
<td>CT release (mini) (limited palmar incision)</td>
<td>80</td>
<td>65.00%</td>
<td>No surgery (Steroid injection) (paramethasone acetonide, 20mg in 1 ml)</td>
<td>83</td>
<td>60.24%</td>
<td>RR</td>
<td>1.08(0.85,1.37)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ly-Pen,D., 2012</td>
<td>Moderate Quality</td>
<td>Symptom relief (pain)(Reached 50% improvement in pain on VAS 100mm scale)</td>
<td>2 years</td>
<td>CT release (mini) (limited palmar incision)</td>
<td>80</td>
<td>63.75%</td>
<td>No surgery (Steroid injection) (paramethasone acetonide, 20mg in 1 ml)</td>
<td>83</td>
<td>57.83%</td>
<td>RR</td>
<td>1.10(0.86,1.41)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ly-Pen,D., 2012</td>
<td>Moderate Quality</td>
<td>Symptom relief (pain)(Reached 70% improvement in pain on VAS 100mm scale)</td>
<td>2 years</td>
<td>CT release (mini) (limited palmar incision)</td>
<td>80</td>
<td>63.75%</td>
<td>No surgery (Steroid injection) (paramethasone acetonide, 20mg in 1 ml)</td>
<td>83</td>
<td>55.42%</td>
<td>RR</td>
<td>1.15(0.89,1.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Jarvik,J.G., 2009</td>
<td>High Quality</td>
<td>Activity of daily living (ADL) (Days of reduced work or housework)</td>
<td>5.9 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>50</td>
<td>4.3(8.80)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>54</td>
<td>6.3(9.40)</td>
<td>Mean Difference</td>
<td>-2(-5.50,1.497980)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Jarvik,J.G., 2009</td>
<td>High Quality</td>
<td>Activity of daily living (ADL) (Days of reduced work or housework)</td>
<td>11.8 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>49</td>
<td>2.2(5.60)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>52</td>
<td>5.2(8.80)</td>
<td>Mean Difference</td>
<td>-3(-5.86,-0.13999)</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference) (P-value&lt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<tr>
<td>Gerritsen, A., 2002</td>
<td>High Quality</td>
<td>Paresthesia (Daytime paresthesia)</td>
<td>3 months</td>
<td>Open CTR (traditional open release)</td>
<td>78</td>
<td>4.8(3.20)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>86</td>
<td>2.2(3.20)</td>
<td>Mean Difference</td>
<td>2.6(1.62,3.5806 89)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Gerritsen, A., 2002</td>
<td>High Quality</td>
<td>Paresthesia (Nighttime paresthesia)</td>
<td>3 months</td>
<td>Open CTR (traditional open release)</td>
<td>78</td>
<td>4.6(3.80)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>86</td>
<td>3.5(3.30)</td>
<td>Mean Difference</td>
<td>1.1(0.01,2.1943 68)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Gerritsen, A., 2002</td>
<td>High Quality</td>
<td>Paresthesia (Daytime paresthesia)</td>
<td>5.9 months</td>
<td>Open CTR (traditional open release)</td>
<td>77</td>
<td>5.5(2.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>84</td>
<td>3.7(3.20)</td>
<td>Mean Difference</td>
<td>1.8(0.86,2.7422 80)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Gerritsen, A., 2002</td>
<td>High Quality</td>
<td>Paresthesia (Nighttime paresthesia)</td>
<td>5.9 months</td>
<td>Open CTR (traditional open release)</td>
<td>77</td>
<td>5.4(3.50)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>84</td>
<td>4.1(3.70)</td>
<td>Mean Difference</td>
<td>1.3(0.19,2.4123 18)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Gerritsen, A., 2002</td>
<td>High Quality</td>
<td>Paresthesia (Daytime paresthesia)</td>
<td>11.8 months</td>
<td>Open CTR (traditional open release)</td>
<td>73</td>
<td>5.5(2.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>83</td>
<td>4(3.40)</td>
<td>Mean Difference</td>
<td>1.5(0.51,2.4887 46)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Gerritsen, A., 2002</td>
<td>High Quality</td>
<td>Paresthesia (Daytime paresthesia)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>5.3(3.00)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>4(3.60)</td>
<td>Mean Difference</td>
<td>1.3(0.23,2.3670 81)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Gerritsen, A., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)(Symptom severity scale)</td>
<td>3 months</td>
<td>Open CTR (traditional open release)</td>
<td>78</td>
<td>1(0.90)</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>83</td>
<td>0.9(0.90)</td>
<td>Mean Difference</td>
<td>0.1(- 0.18,0.378179)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Gerritsen,A. A., 2002</td>
<td>High</td>
<td>Questionnaire (Levine-SSS)(Symptom severity scale)</td>
<td>5.9 months</td>
<td>Open CTR (traditional open release)</td>
<td>77</td>
<td>1.3(0.80 )</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>86</td>
<td>0.6(0.70</td>
<td>Mean Difference</td>
<td>0.7(0.47,0.9319 87)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<tr>
<td>Gerritsen,A. A., 2002</td>
<td>High</td>
<td>Questionnaire (Levine-SSS)(Symptom severity scale)</td>
<td>11.8 months</td>
<td>Open CTR (traditional open release)</td>
<td>73</td>
<td>1.3(0.80 )</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>84</td>
<td>0.9(0.80</td>
<td>Mean Difference</td>
<td>0.4(0.15,0.6508 96)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Gerritsen,A. A., 2002</td>
<td>High</td>
<td>Questionnaire (Levine-SSS)(Symptom severity scale)</td>
<td>1.5 years</td>
<td>Open CTR (traditional open release)</td>
<td>68</td>
<td>1.3(0.80 )</td>
<td>Splinting (instructed to wear splint during the night for 6 weeks)</td>
<td>79</td>
<td>0.9(0.90</td>
<td>Mean Difference</td>
<td>0.4(0.13,0.6748 54)</td>
<td>Open CTR (traditional open release) (P-value&lt;.05)</td>
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<td>Hui,A.C., 2005</td>
<td>High</td>
<td>Questionnaire/Scale (GSS)(0 (no symptoms) to 50 (most severe))</td>
<td>4.6 months</td>
<td>CT release (open) (traditional open release)</td>
<td>25</td>
<td>4.3(5.60 )</td>
<td>No surgery (steroid injection) (15 mg of methylprednisolone acetate injected into carpal tunnel)</td>
<td>25</td>
<td>16.6(12.30</td>
<td>Mean Difference</td>
<td>-12.3(-17.60, -7.00219)</td>
<td>CT release (open) (traditional open release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ismatullah,I., 2013</td>
<td>High</td>
<td>Questionnaire/Scale (GSS)( )</td>
<td>3 months</td>
<td>CT release (open) (traditional open release)</td>
<td>20</td>
<td>5.45(6.90)</td>
<td>No surgery (Steroid injection) (local steroid injection)</td>
<td>20</td>
<td>22.1(6.90</td>
<td>Mean Difference</td>
<td>-16.65(-20.93, -12.3738)</td>
<td>CT release (open) (traditional open release) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Jarvik,J.G., 2009</td>
<td>High</td>
<td>Questionnaire (CTSAQ)(Symptoms(1-5))</td>
<td>5.9 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>50</td>
<td>2.02(1.03)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>54</td>
<td>2.42(0.80</td>
<td>Mean Difference</td>
<td>-0.4(-0.76, -0.04357)</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference) (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Jarvik, J.G., 2009</td>
<td>High Quality</td>
<td>Questionnaire (CTSAQ) (Symptoms (1-5))</td>
<td>11.8 months</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference)</td>
<td>49</td>
<td>1.74(0.76)</td>
<td>No surgery (NSAIDs w/ hand therapy) (Non-steroidal anti-inflammatory drugs and 6 hand therapy sessions over 6 weeks)</td>
<td>52</td>
<td>2.07(0.88)</td>
<td>Mean Difference</td>
<td>-0.33(-0.65, 0.00985)</td>
<td>CT release (Open/Endoscopic) (Open or Endoscopic CTR based on surgeon preference) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>Paresthesia (Nocturnal paresthesia (100mm VAS scale))</td>
<td>3 months</td>
<td>CT release (open) ()</td>
<td>67</td>
<td>16(25.00)</td>
<td>No surgery (steroid injection) ()</td>
<td>80</td>
<td>8(17.00)</td>
<td>Mean Difference</td>
<td>8(0.95, 15.0507 8)</td>
<td>No surgery (steroid injection) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>Paresthesia (Nocturnal paresthesia (100mm VAS scale))</td>
<td>5.9 months</td>
<td>CT release (open) ()</td>
<td>63</td>
<td>7(17.00)</td>
<td>No surgery (steroid injection) ()</td>
<td>77</td>
<td>13(21.00)</td>
<td>Mean Difference</td>
<td>-6(-12.29, 0.294796 )</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Andreu, J.L., 2013</td>
<td>Moderate Quality</td>
<td>Paresthesia (Nocturnal paresthesia (100mm VAS scale))</td>
<td>11.8 months</td>
<td>CT release (open) ()</td>
<td>45</td>
<td>3(11.00)</td>
<td>No surgery (steroid injection) ()</td>
<td>50</td>
<td>12(19.00)</td>
<td>Mean Difference</td>
<td>-9(-15.17, -2.83023)</td>
<td>CT release (open) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Ly-Pen, D., 2012</td>
<td>Moderate Quality</td>
<td>Paresthesia (Reached 20% improvement in nocturnal parthesia on VAS 100mm scale)</td>
<td>2 years</td>
<td>CT release (mini) (limited palmar incision)</td>
<td>80</td>
<td>68.75%</td>
<td>No surgery (Steroid injection) (paramethasone acetonide, 20mg in 1 ml)</td>
<td>83</td>
<td>60.24%</td>
<td>RR</td>
<td>1.14(0.91,1.43)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Ly-Pen, D., 2012</td>
<td>Moderate Quality</td>
<td>Paresthesia (Reached 50% improvement in nocturnal parthesia on VAS 100mm scale)</td>
<td>2 years</td>
<td>CT release (mini) (limited palmar incision)</td>
<td>80</td>
<td>67.50%</td>
<td>No surgery (Steroid injection) (paramethasone acetonide, 20mg in 1 ml)</td>
<td>83</td>
<td>56.63%</td>
<td>RR</td>
<td>1.19(0.94,1.52)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/ P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
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<tr>
<td>Ly-Pen,D., 2012</td>
<td>Moderate Quality</td>
<td>Paresthesia (Reached 70% improvement in nocturnal parthesia on VAS 100mm scale)</td>
<td>2 years</td>
<td>CT release (mini) (limited palmar incision)</td>
<td>80</td>
<td>67.50%</td>
<td>No surgery (Steroid injection) (paramethasone acetone, 20mg in 1 ml)</td>
<td>83</td>
<td>50.60%</td>
<td>RR</td>
<td>1.33(1.03,1.73)</td>
<td>CT release (mini) (limited palmar incision) (P-value&lt;.05)</td>
</tr>
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</table>
META-ANALYSES

FIGURE 13: PICO 7 PART 1 ENDOSCOPIC VERSUS OPEN: SYMPTOM RECURRENCE: PAIN

NOTE: Weights are from random effects analysis.
ADJUNCTIVE TECHNIQUES

Moderate evidence supports that there is no benefit to routine inclusion of the following adjunctive techniques: epineurotomy, neurolysis, flexor tenosynovectomy, and lengthening/reconstruction of the flexor retinaculum (transverse carpal ligament).

Strength of Recommendation: Moderate Evidence

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

Rationale

Epineurotomy: There are two high quality studies (Leinberry 1997 and Crnkovic 2012) and one moderate quality study (Blair 1996) that evaluated carpal tunnel release alone versus the addition of epineurotomy of the median nerve. The Leinberry (1997) evaluated patients at 11.8 months after surgery. There was no significant difference found in clinical evaluation (Boston Questionnaire, APB strength, Phalen’s, Tinel’s, or two-point discrimination) or in symptom recurrence. Crnkovic (2012) studied nerve volume measured by MRI as an index of nerve recovery. Patients were evaluated at 3 and 6 months after surgery and no significant differences was noted at either time point. There were also no differences found for the symptoms of pain between the groups. Blair (1996) found no differences in post-operative two-point discrimination, pain, or ability to complete activities of daily living at a minimum of two years following surgery. There were also no differences electrodiagnostic parameters.

Neurolysis: There was one high quality study (Mackinnon 1991) and one moderate quality study (Lowry 1988) which evaluated the addition of neurolysis of the median nerve to a standard carpal tunnel release. The Mackinnon study focused on internal neurolysis and found no differences in thenar atrophy, muscle strength, pressure threshold, vibration threshold and static two-point discrimination at 12 months after surgery. No difference was noted in pinch or grip strength. The Lowry study evaluated the NCS findings at 3 months after surgery and did not find a difference in nerve conduction velocity or distal motor and sensory latency. Neither study found a difference in symptom relief or recurrence.

Flexor Tenosynovectomy: There was one high quality study (Shum 2002) evaluating flexor tenosynovectomy as an adjunct to carpal tunnel release. There was no difference in surgical site infection, scar sensitivity, wrist motion, finger motion, or Boston Carpal Tunnel Questionnaire at 12 months following surgery.

Flexor Retinaculum Reconstruction/Lengthening: There was one high quality study (Dias 2004) that evaluated flexor retinaculum lengthening/reconstruction. Six months following surgery there were no differences in grip strength, Jebsen Taylor score, Phalen test, pinch strength, Boston Carpal Tunnel Questionnaire score or symptom recurrence.

Risks and Harms of Implementing this Recommendation

There are no known harms with implementation of this recommendation.
Future Research
Future research should be directed on conducting studies with larger sample sizes. There may also be certain subsets of patients who would benefit from regular inclusion of these adjunctive procedures, and future research can focus on such subsets.
### STUDY QUALITY TABLE OF ADJUNCTIVE SURGICAL TECHNIQUES

#### TABLE 164: OBSERVATIONAL STUDY QUALITY

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shiota,E., 2001</td>
<td>O</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

#### TABLE 165: RANDOMIZED TRIAL QUALITY

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crnkovi?,-T, 2012</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>High Quality</td>
</tr>
<tr>
<td>Blair, W.F., 1996</td>
<td>O</td>
<td>O</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Include</td>
<td>Moderate Quality</td>
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<tr>
<td>Dias, J.J., 2004</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Kharwadkar, N., 2005</td>
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<td>✓</td>
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<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<td>High Quality</td>
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<tr>
<td>Leinberry, C.F., 1997</td>
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<td>✓</td>
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<td>High Quality</td>
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<td>Lowry, W.E., Jr., 1988</td>
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<td>✓</td>
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<td>✓</td>
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<td>✓</td>
<td>Include</td>
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<td>Mackinnon, S.E., 1991</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Shum, C., 2002</td>
<td>✓</td>
<td>O</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Include</td>
<td>High Quality</td>
</tr>
</tbody>
</table>
### RESULTS

#### SUMMARY OF DATA FINDINGS

**TABLE 166: SUMMARY OF FINDINGS PICO 8 ADJUNCTIVE/ALTERNATIVE SURGICAL TECHNIQUES (EARLY FOLLOW-UP (3 MONTHS UP TO 6 MONTHS))**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Favors treatment 2</strong> (Black)</td>
<td>- Lowry, W. E., Jr., 1988</td>
<td>- Shiota, E., 2001</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Not significant</strong> (Orange)</td>
<td></td>
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</tbody>
</table>

#### Complications
- Symptom occurrence (scar tenderness)  
  - Crnković-T, 2012

#### Function
- Grip Strength
- Jebsen Taylor score
- NCS (DML)
- NCS (DSL)
- NCS (NCV)
- Phalen’s test score
- Pinch Strength
- Questionnaire (Boston-FSS)
- Questionnaire (Levine-FSS)

#### Pain
- Questionnaire/Scale (VAS-pain)
  - VAS for pillar pain (SD not provided for all subgroups)

#### Symptoms
- Questionnaire (Boston-SSS)
- Questionnaire (Levine-SSS)
- Symptom recurrence (general)
### TABLE 167: SUMMARY OF FINDINGS PICO 8 ADJUNCTIVE/ALTERNATIVE SURGICAL TECHNIQUES (LATEFOLLOW-UP (> 6 MONTHS))

<table>
<thead>
<tr>
<th>Favors treatment 1</th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors treatment 2</td>
<td></td>
<td></td>
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<tr>
<td>Not significant</td>
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<thead>
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<tbody>
<tr>
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<tr>
<td>Surgical site infection</td>
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<tr>
<td>Function</td>
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</tr>
<tr>
<td>Grip Strength</td>
<td></td>
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<tr>
<td>Improvement of strength</td>
<td></td>
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<tr>
<td>Average strength of the abductor pollicis brevis muscle</td>
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<tr>
<td>NCS (motor conduction latency)</td>
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<tr>
<td>NCS (DML)</td>
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<tr>
<td>NCS (motor amplitude)</td>
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<tr>
<td>Phalen's test score</td>
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<tr>
<td>Questionnaire (Levine-FSS)</td>
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<tr>
<td>Thenar atrophy</td>
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<tr>
<td>Tinel's Sign/Test</td>
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<tr>
<td>Two-point discrimination</td>
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<tr>
<td>Pain</td>
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<tr>
<td>Questionnaire (General/Undefined)</td>
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<tr>
<td>General pain (non-questionnaire)</td>
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<tr>
<td>Quality Of Life</td>
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<td>Activity of daily living (ADL)</td>
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<td>Difficulty in lifting</td>
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<td>Symptoms</td>
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<tr>
<td>Questionnaire (Levine-SSS)</td>
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<tr>
<td>Symptom recurrence (general)</td>
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<td>Symptom recurrence (numbness)</td>
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<td>Symptom relief (general)</td>
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<tr>
<td>Surgical site infection</td>
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<tr>
<td>Function</td>
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<tr>
<td>Grip Strength</td>
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<td>NCS (motor conduction latency)</td>
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<td>NCS (DML)</td>
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<td>NCS (motor amplitude)</td>
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<td>Phalen's test score</td>
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<td>Questionnaire (Levine-FSS)</td>
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<td>Thenar atrophy</td>
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<td>Two-point discrimination</td>
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<td>Pain</td>
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<tr>
<td>Questionnaire (General/Undefined)</td>
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<tr>
<td>Quality Of Life</td>
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<td>Activity of daily living (ADL)</td>
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<td>Difficulty in lifting</td>
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<td>Symptoms</td>
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<tr>
<td>Questionnaire (Levine-SSS)</td>
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<tr>
<td>Symptom recurrence (general)</td>
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<tr>
<td>Symptom recurrence (numbness)</td>
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<tr>
<td>Symptom relief (general)</td>
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</tbody>
</table>

- Low Quality: NA
### DETAILED DATA FINDINGS

**TABLE 168: PICO 8 PART 1- ADJUNCTIVE/ALTERNATIVE SURGICAL TECHNIQUES: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kharwadkar,N., 2005</td>
<td>High Quality</td>
<td>Symptom occurrence (scar tenderness)(Mild, moderate, or severe)</td>
<td>3 months</td>
<td>CT release-open (w/ absorbable sutures) (CT release (w/ absorbable sutures))</td>
<td>18</td>
<td>33.33%</td>
<td>CT release-open (w/ non-absorbable sutures) (CT release (w/ non-absorbable sutures))</td>
<td>18</td>
<td>44.44%</td>
<td>RR</td>
<td>0.75(0.33,1.72)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Shum,C., 2002</td>
<td>High Quality</td>
<td>Surgical site infection( )</td>
<td>11.8 months</td>
<td>CT release (w/ no flexor tenosynovectomy) (Wrist treated by open CT release w/ no flexor tenosynovectomy)</td>
<td>44</td>
<td>0.00%</td>
<td>CT release (w/ flexor tenosynovectomy) (Wrist treated by open CT release with a flexor tenosynovectomy)</td>
<td>44</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
### TABLE 169: PICO 8 PART 1 - ADJUNCTIVE/ALTERNATIVE SURGICAL TECHNIQUES: FUNCTION

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Treatment 2 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crnkovi-T, 2012</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (ms) (# of patients not improved))</td>
<td>3 months</td>
<td>CT release (w/ no epineurotomy)-control (Open-field release without epineurotomy)</td>
<td>CT release (w/ epineurotomy)-test (Open-field surgical carpal tunnel release followed by a longitudinal epineurotomy of the nerve)</td>
<td>25</td>
<td>32.00%</td>
<td>25</td>
<td>24.00%</td>
<td>RR</td>
<td>1.33(0.54,3.29)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Crnkovi-T, 2012</td>
<td>High Quality</td>
<td>NCS (DML) (Distal motor latency (ms) (# of patients not improved))</td>
<td>5.9 months</td>
<td>CT release (w/ no epineurotomy)-control (Open-field release without epineurotomy)</td>
<td>CT release (w/ epineurotomy)-test (Open-field surgical carpal tunnel release followed by a longitudinal epineurotomy of the nerve)</td>
<td>25</td>
<td>32.00%</td>
<td>25</td>
<td>16.00%</td>
<td>RR</td>
<td>2.00(0.69,5.80)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Crnkovi-T, 2012</td>
<td>High Quality</td>
<td>NCS (DSL) (Distal sensory latency (ms) (# of patients not improved))</td>
<td>3 months</td>
<td>CT release (w/ no epineurotomy)-control (Open-field release without epineurotomy)</td>
<td>CT release (w/ epineurotomy)-test (Open-field surgical carpal tunnel release followed by a longitudinal epineurotomy of the nerve)</td>
<td>24</td>
<td>52.00%</td>
<td>24</td>
<td>54.17%</td>
<td>RR</td>
<td>0.96(0.57,1.63)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Crnkovi-T, 2012</td>
<td>High Quality</td>
<td>NCS (DSL) (Distal sensory latency (ms) (# of patients not improved))</td>
<td>5.9 months</td>
<td>CT release (w/ no epineurotomy)-control (Open-field release without epineurotomy)</td>
<td>CT release (w/ epineurotomy)-test (Open-field surgical carpal tunnel release followed by a longitudinal epineurotomy of the nerve)</td>
<td>25</td>
<td>36.00%</td>
<td>24</td>
<td>41.67%</td>
<td>RR</td>
<td>0.86(0.43,1.75)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dias, J.J., 2004</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>5.8 months</td>
<td>CT release-open (divide) (CT release (flexor retinaculum divided))</td>
<td>CT release-open (lengthen) ()</td>
<td>26</td>
<td>21.2(8.85)</td>
<td>26</td>
<td>21.5(9.11)</td>
<td>Mean Difference</td>
<td>-0.3(-5.18,4.58)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Dias,J.J., 2004</td>
<td>High Quality</td>
<td>Jebsen Taylor score(Seconds)</td>
<td>3 months</td>
<td>CT release-open (divide) (CT release (flexor retinaculum divided))</td>
<td>26</td>
<td>67.6(22.37)</td>
<td>CT release-open (lengthen) ( )</td>
<td>26</td>
<td>66.3(21.85)</td>
<td>Mean Difference</td>
<td>1.3(-10.72,13.32)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dias,J.J., 2004</td>
<td>High Quality</td>
<td>Phalen's test score(# positive)</td>
<td>5.8 months</td>
<td>CT release-open (divide) (CT release (flexor retinaculum divided))</td>
<td>26</td>
<td>3.85%</td>
<td>CT release-open (lengthen) ( )</td>
<td>26</td>
<td>3.85%</td>
<td>RR</td>
<td>1.00(0.07,15.15)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dias,J.J., 2004</td>
<td>High Quality</td>
<td>Pinch Strength(Kilograms)</td>
<td>5.8 months</td>
<td>CT release-open (divide) (CT release (flexor retinaculum divided))</td>
<td>26</td>
<td>6.4(1.82)</td>
<td>CT release-open (lengthen) ( )</td>
<td>26</td>
<td>6.5(1.82)</td>
<td>Mean Difference</td>
<td>-0.1(-1.09,0.89)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Dias,J.J., 2004</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS)( )</td>
<td>5.8 months</td>
<td>CT release-open (divide) (CT release (flexor retinaculum divided))</td>
<td>26</td>
<td>1.2(0.26)</td>
<td>CT release-open (lengthen) ( )</td>
<td>26</td>
<td>1.3(0.52)</td>
<td>Mean Difference</td>
<td>-0.1(-0.32,0.12)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Kharwadkar,N., 2005</td>
<td>High Quality</td>
<td>Questionnaire (Boston-FSS)(Boston CTS Questionnaire (functional status scale))</td>
<td>3 months</td>
<td>CT release-open (w/ absorbable sutures) (CT release (w/ absorbable sutures))</td>
<td>18</td>
<td>1.1(0.39)</td>
<td>CT release-open (w/ non-absorbable sutures) (CT release (w/ non-absorbable sutures))</td>
<td>18</td>
<td>1.1(0.69)</td>
<td>Mean Difference</td>
<td>0(-0.37,0.366158)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Leinberry,C.F., 1997</td>
<td>High Quality</td>
<td>Improvement of strength(Average strength of the abductor pollicis brevis muscle)</td>
<td>11.8 months</td>
<td>CT release (w/ no epineuromy) (release of the transverse carpal ligament alone,)</td>
<td>25</td>
<td>4.3( )</td>
<td>CT release (w/ epineuromy) (release and adjuvant epineuromy of the median nerve.)</td>
<td>25</td>
<td>4.2( )</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Leinberry,C.F., 1997</td>
<td>High Quality</td>
<td>Phalen's test score(# positive)</td>
<td>11.8 months</td>
<td>CT release (w/ no epineuromy) (release of the transverse carpal ligament alone,)</td>
<td>25</td>
<td>8.00%</td>
<td>CT release (w/ epineuromy) (release and adjuvant epineuromy of the median nerve.)</td>
<td>25</td>
<td>16.00%</td>
<td>RR</td>
<td>0.50(0.10,2.49)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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<tr>
<td>Leinberry,C.F., 1997</td>
<td>High Quality</td>
<td>Tinel's Sign/Test(%) positive</td>
<td>11.8 months</td>
<td>CT release (w/ no epineurotomy) (release of the transverse carpal ligament alone,)</td>
<td>25</td>
<td>24.00%</td>
<td>CT release (w/ epineurotomy) (release and adjuvant epineurotomy of the median nerve.)</td>
<td>25</td>
<td>44.00%</td>
<td>RR</td>
<td>0.55(0.24,1.25)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Leinberry,C.F., 1997</td>
<td>High Quality</td>
<td>Two-point discrimination(Millimeters)</td>
<td>11.8 months</td>
<td>CT release (w/ no epineurotomy) (release of the transverse carpal ligament alone,)</td>
<td>25</td>
<td>5.1(,)</td>
<td>CT release (w/ epineurotomy) (release and adjuvant epineurotomy of the median nerve.)</td>
<td>25</td>
<td>4.7(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Mackinnon,S.E., 1991</td>
<td>High Quality</td>
<td>Thenar Atrophy((0-5 scale))</td>
<td>11.8 months</td>
<td>CT release (w/ no neurolysis) ()</td>
<td>32</td>
<td>40.63%</td>
<td>CT release (w/ neurolysis) ()</td>
<td>31</td>
<td>35.48%</td>
<td>RR</td>
<td>1.14(0.61,2.16)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Mackinnon,S.E., 1991</td>
<td>High Quality</td>
<td>Two-point discrimination(&gt;3 millimeters)</td>
<td>11.8 months</td>
<td>CT release (w/ no neurolysis) ()</td>
<td>32</td>
<td>28.13%</td>
<td>CT release (w/ neurolysis) ()</td>
<td>31</td>
<td>25.81%</td>
<td>RR</td>
<td>1.09(0.48,2.46)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Shum,C., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-FSS)(Mean functional status score)</td>
<td>11.8 months</td>
<td>CT release (w/ no flexor tenosynovectomy) (Wrist by treated by open CT release w/ no flexor tenosynovectomy)</td>
<td>44</td>
<td>1.6(0.62)</td>
<td>CT release (w/ flexor tenosynovectomy) (Wrist by treated by open CT release with a flexor tenosynovectomy)</td>
<td>44</td>
<td>1.7(0.71)</td>
<td>Mean Difference</td>
<td>-0.1(-0.38,0.178521)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Blair,W.F., 1996</td>
<td>Moderate Quality</td>
<td>NCS (DML)(Wrist motor latency)</td>
<td>2 years</td>
<td>CT release (w/ no Epineurotomy) (CT release (w/o epineurotomy))</td>
<td>27</td>
<td>. %</td>
<td>CT release (w/ Epineurotomy) (CT release (w/ epineurotomy))</td>
<td>48</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (w/ Epineurotomy) (CT release (w/ epineurotomy)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Blair,W.F., 1996</td>
<td>Moderate Quality</td>
<td>NCS (MA)(Motor amplitude)</td>
<td>2 years</td>
<td>CT release (w/ no Epineurotomy) (CT release (w/o epineurotomy))</td>
<td>24</td>
<td>. %</td>
<td>CT release (w/ Epineurotomy) (CT release (w/ epineurotomy))</td>
<td>48</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (w/ Epineurotomy) (CT release (w/ epineurotomy)) (P-value&lt;.05)</td>
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<tr>
<td>Lowry,W.E.,Jr., 1988</td>
<td>Moderate Quality</td>
<td>NCS (DML)(Distal motor latency (ms))</td>
<td>3 months</td>
<td>CT release (w/ no neurolysis) (Standard ligament release w/ no neurolysis)</td>
<td>23</td>
<td>5(1.10)</td>
<td>CT release (w/ neurolysis) (Standard ligament release w/ neurolysis)</td>
<td>23</td>
<td>4.8(0.90)</td>
<td>Mean Difference</td>
<td>0.2(-0.38,0.780855)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Lowry, W.E., Jr., 1988</td>
<td>Moderate Quality</td>
<td>NCS (DSL) (Distal sensory latency (ms))</td>
<td>3 months</td>
<td>CT release (w/ no neurolysis) (Standard ligament release w/ no neurolysis)</td>
<td>CT release (w/ neurolysis) (Standard ligament release w/ no neurolysis)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Lowry, W.E., Jr., 1988</td>
<td>Moderate Quality</td>
<td>NCS (NCV) (Nerve conduction velocity)</td>
<td>3 months</td>
<td>CT release (w/ no neurolysis) (Standard ligament release w/ no neurolysis)</td>
<td>CT release (w/ neurolysis) (Standard ligament release w/ no neurolysis)</td>
<td>Mean Difference</td>
<td>Not Significant (P-value&gt;.05)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Shiota, E., 2001</td>
<td>Low Quality</td>
<td>Grip strength (Kilograms)</td>
<td>3.9 months</td>
<td>CT release (w/ no synovectomy) (CT release alone)</td>
<td>CT release (w/ synovectomy) (Enlargement reconstruction of the flexor retinaculum with synovectomy)</td>
<td>Author Reported</td>
<td>CT release (w/ synovectomy) (Enlargement reconstruction of the flexor retinaculum with synovectomy) (P-value&lt;.05)</td>
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<tr>
<td>Shiota, E., 2001</td>
<td>Low Quality</td>
<td>Grip strength (Kilograms)</td>
<td>6 months</td>
<td>CT release (w/ no synovectomy) (CT release alone)</td>
<td>CT release (w/ synovectomy) (Enlargement reconstruction of the flexor retinaculum with synovectomy)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Shiota, E., 2001</td>
<td>Low Quality</td>
<td>NCS (Motor conduction latency (msec))</td>
<td>2 years</td>
<td>CT release (w/ no synovectomy) (CT release alone)</td>
<td>CT release (w/ synovectomy) (Enlargement reconstruction of the flexor retinaculum with synovectomy)</td>
<td>Mean Difference</td>
<td>CT release (w/ no synovectomy) (CT release alone) (P-value&lt;.05)</td>
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</tbody>
</table>

Note: SD = Standard Deviation, CI = Confidence Interval, CT = Common Tendon, NCS = Nerve Conduction Study, DSL = Distal Sensory Latency, NCV = Nerve Conduction Velocity.
### TABLE 170: PICO 8 PART 1- ADJUNCTIVE/ALTERNATIVE SURGICAL TECHNIQUES: PAIN

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kharwadkar,N., 2005</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)/(VAS for pillar pain (SD not provided for all subgroups))</td>
<td>3 months</td>
<td>CT release-open (w/ absorbable sutures) (CT release (w/ absorbable sutures))</td>
<td>18</td>
<td>0(.)</td>
<td>CT release-open (w/ non-absorbable sutures) (CT release (w/ non-absorbable sutures))</td>
<td>18</td>
<td>0.67(0.50)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Blair, W.F., 1996</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)/(General pain (non-questionnaire))</td>
<td>2 years</td>
<td>CT release (w/ no Epineurotomy) (CT release (w/o epineurotomy))</td>
<td>27</td>
<td>29.63%</td>
<td>CT release (w/ Epineurotomy) (CT release (w/ epineurotomy))</td>
<td>48</td>
<td>12.50%</td>
<td>RR</td>
<td>2.37(0.92,6.12)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Blair, W.F., 1996</td>
<td>Moderate Quality</td>
<td>Activity of daily living (ADL) (Difficulty in lifting)</td>
<td>2 years</td>
<td>CT release (w/o Epineurotomy) (CT release (w/o epineurotomy))</td>
<td>27</td>
<td>25.93%</td>
<td>CT release (w/ Epineurotomy) (CT release (w/ epineurotomy))</td>
<td>48</td>
<td>18.75%</td>
<td>RR</td>
<td>1.38 (0.58, 3.29)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Dias, J.J., 2004</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)( )</td>
<td>5.8 months</td>
<td>CT release-open (divide) (CT release (flexor retinaculum divided))</td>
<td>CT release-open (lengthen) ( )</td>
<td>Mean Difference</td>
<td>0(-0.28,0.28)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Dias, J.J., 2004</td>
<td>High Quality</td>
<td>Symptom recurrence (general)(Wrist stiffness (mild or moderate))</td>
<td>5.8 months</td>
<td>CT release-open (divide) (CT release (flexor retinaculum divided))</td>
<td>CT release-open (lengthen) ( )</td>
<td>Mean Difference</td>
<td>0.00%</td>
<td>RD 0.04(-0.04,0.11)</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
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<tr>
<td>Kharwadkar, N., 2005</td>
<td>High Quality</td>
<td>Questionnaire (Boston-SSS)(Boston CTS Questionnaire (symptom severity scale))</td>
<td>3 months</td>
<td>CT release-open (w/ absorbable sutures) (CT release (w/ absorbable sutures))</td>
<td>CT release-open (w/ non-absorbable sutures) (CT release (w/ non-absorbable sutures))</td>
<td>Mean Difference</td>
<td>0(-0.15,0.150833 )</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Leinberry, C.F., 1997</td>
<td>High Quality</td>
<td>Symptom recurrence (general)(@ 12 month post-op)</td>
<td>11.8 months</td>
<td>CT release (w/ no epineurotomy) (release of the transverse carpal ligament alone,)</td>
<td>CT release (w/ epineurotomy) (release and adjuvant epineurotomy of the median nerve.)</td>
<td>Mean Difference</td>
<td>0.91(0.47,1.75 )</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Mackinnon, S. E., 1991</td>
<td>High Quality</td>
<td>Symptom relief (general)(# of events=patients' symptoms not relieving)</td>
<td>11.8 months</td>
<td>CT release (w/ no neurolysis) ( )</td>
<td>CT release (w/ neurolysis) ( )</td>
<td>Mean Difference</td>
<td>0.65(0.20,2.07 )</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Shum,C., 2002</td>
<td>High Quality</td>
<td>Questionnaire (Levine-SSS)(Mean symptom-severity score)</td>
<td>11.8 months</td>
<td>CT release (w/ no flexor tenosynovectomy) (Wrist treated by open CT release w/ no flexor tenosynovectomy)</td>
<td>44</td>
<td>1.6(0.70)</td>
<td>CT release (w/ flexor tenosynovectomy) (Wrist treated by open CT release with a flexor tenosynovectomy)</td>
<td>44</td>
<td>1.6(0.68)</td>
<td>Mean Difference</td>
<td>0(-0.29,0.288362)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Blair,W.F., 1996</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (numbness)(Numbness (pre-op numbness, and post-op numbness))</td>
<td>2 years</td>
<td>CT release (w/ no Epineurotomy) (CT release (w/o epineurotomy))</td>
<td>27</td>
<td>44.44%</td>
<td>CT release (w/ Epineurotomy) (CT release (w/ epineurotomy))</td>
<td>48</td>
<td>20.83%</td>
<td>RR</td>
<td>2.13(1.07,4.27)</td>
<td>CT release (w/ Epineurotomy) (CT release (w/ epineurotomy)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Lowry,W.E.,Jr , 1988</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general)</td>
<td>3 months</td>
<td>CT release (w/ no neurolysis) (Standard ligament release w/ no neurolysis)</td>
<td>23</td>
<td>8.70%</td>
<td>CT release (w/ neurolysis) (Standard ligament release w/ neurolysis)</td>
<td>24</td>
<td>4.17%</td>
<td>RR</td>
<td>2.09(0.20,21.48)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Shiota,E., 2001</td>
<td>Low Quality</td>
<td>Symptom recurrence (general)(With mean follow-up of 1.6 years)</td>
<td>2 years</td>
<td>CT release (w/ no synovectomy) (CT release alone)</td>
<td>43</td>
<td>25.58%</td>
<td>CT release (w/ synovectomy) (Enlargement reconstruction of the flexor retinaculum with synovectomy)</td>
<td>70</td>
<td>10.00%</td>
<td>RR</td>
<td>2.56(1.07,6.10)</td>
<td>CT release (w/ synovectomy) (Enlargement reconstruction of the flexor retinaculum with synovectomy) (P-value&lt;.05)</td>
</tr>
</tbody>
</table>
**BILATERAL VERSUS STAGED CARPAL TUNNEL RELEASE**

Limited evidence supports that simultaneous bilateral or staged endoscopic carpal tunnel release might be performed based on patient and surgeon preference. No evidence meeting the inclusion criteria was found addressing bilateral simultaneous open carpal tunnel release.

**Strength of Recommendation: Limited Evidence ⭐⭐⭐⭐

Description:** Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

**Rationale**

There were two low strength studies (Fehringer 2002, Nesbitt 2006) which looked at simultaneous and staged endoscopic carpal tunnel releases. There were no studies that met our inclusion criteria which evaluated open release. The results of these studies were conflicting. For example, grip strength in short term follow-up was better in the staged group, but return to work was faster in the simultaneous group. Patient-specific factors, such as quality of life, non-employment work, care-giving, family and community responsibilities were not addressed. Both studies were limited in that there was no randomization of treatment protocols. Patients selected simultaneous or staged procedures, and both groups were satisfied with their choices. At 6 month follow up, there was no difference between the two groups.

Because no studies comparing simultaneous versus staged procedures for open release were considered, there are no data to support concurrent or sequential bilateral open carpal tunnel releases. This does not constitute a mandate that bilateral simultaneous carpal tunnel releases should be performed endoscopically.

Implications of two versus one surgical experience such as two anesthetics, total analgesic consumption, costs of two OR and perioperative nursing unit visits were not addressed.

**Risks and Harms of Implementing this Recommendation**

There are no known harms associated with implementing this recommendation.

**Future Research**

Studies of simultaneous versus staged open carpal tunnel releases with adequate follow up would be helpful in elucidating whether simultaneous open release should be considered as a treatment option.

Studies which define return to work status by rigorous, objective criteria would be helpful to define the strength of the recommendation regarding simultaneous releases.
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fehringer, E.V., 2002</td>
<td>◯</td>
<td>◯</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>◯</td>
<td>◯</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>
### RESULTS

**SUMMARY OF DATA FINDINGS**

**TABLE 174: SUMMARY OF FINDINGS PICO 9 SIMULTANEOUS BI-LATERAL RELEASE (EARLY FOLLOW-UP (3 MONTHS UP TO 6 MONTHS))**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Low Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors treatment 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Favors treatment 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not significant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grip Strength</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Phalen’s test score</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Pinch Strength</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Questionnaire (General/Undefined)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Functional severity</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Semmes-Weinstein Monofilaments Test (SW test)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Tinel’s Sign/Test</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Quality Of Life</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return to Work (weeks)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaire (General/Undefined)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Symptom severity</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>
### TABLE 175: SUMMARY OF FINDINGS PICO 9 SIMULTANEOUS BI-LATERAL RELEASE TECHNIQUES (LATEFOLLOW-UP (> 6 MONTHS))

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Low Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors treatment 1</td>
<td>☢</td>
<td></td>
</tr>
<tr>
<td>Favors treatment 2</td>
<td>☢</td>
<td></td>
</tr>
<tr>
<td>Not significant</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
<td>Fehringer, E.V., 2002</td>
<td></td>
</tr>
<tr>
<td><strong>Quality Of Life</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient satisfaction (general)</td>
<td>☐</td>
<td>NA</td>
</tr>
<tr>
<td>Return to normal activities</td>
<td>☐</td>
<td>NA</td>
</tr>
<tr>
<td>Average number of days before return to light duty</td>
<td>☐</td>
<td>NA</td>
</tr>
<tr>
<td>Average number of days before return to Regular Duty</td>
<td>☐</td>
<td>NA</td>
</tr>
</tbody>
</table>
### DETAILED DATA FINDINGS

**TABLE 176: PICO 9- CT RELEASE (SIMULTANEOUS VERSUS STAGED): FUNCTION**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Grip strength(Kilograms)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>32(.)</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>27(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Grip strength(Kilograms)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>32(.)</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>30(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Grip strength(Kilograms)</td>
<td>5.9 months</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>27(.)</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>30(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Phalen's test score(% positive)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>8.33%</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>3.57%</td>
<td>RR</td>
<td>2.33(0.16,34.31)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Phalen's test score(% positive)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>8.33%</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>0.00%</td>
<td>RD</td>
<td>0.08(-0.07,0.24)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Phalen's test score(% positive)</td>
<td>5.9 months</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>0.00%</td>
<td>CT release (staged-endoscopic [&gt;3weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>3.57%</td>
<td>RD</td>
<td>-0.04(-0.10,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Pinch Strength(Kilograms)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>8.1(.)</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>7.6(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Pinch Strength(Kilograms)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>8.1(.)</td>
<td>CT release (staged-endoscopic [&gt;3weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>7.6(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Pinch Strength(Kilograms)</td>
<td>5.9 months</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>7.6(.)</td>
<td>CT release (staged-endoscopic [&gt;3weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>7.6(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Questionnaire (General/undefined)(Functional severity)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>1.3(.)</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>1.3(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Questionnaire (General/undefined)(Functional severity)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>1.3(.)</td>
<td>CT release (staged-endoscopic (&gt;3weeks apart)) (28 (56 hands))</td>
<td>28</td>
<td>1.3(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Questionnaire (General/undefined)(Functional severity)</td>
<td>5.9 months</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>1.3(.)</td>
<td>CT release (staged-endoscopic (&gt;3weeks apart)) (28 (56 hands))</td>
<td>28</td>
<td>1.3(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Semmes Weinstein Monofilaments Test (SW test)( )</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>1.7(.)</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>1.8(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Nesbitt,K.S., 2006</td>
<td>Low Quality</td>
<td>Semmes Weinstein Monofilaments Test (SW test)( )</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>1.7(.)</td>
<td>CT release (staged-endoscopic (&gt;3weeks apart)) (28 (56 hands))</td>
<td>28</td>
<td>1.7(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favor Treatment</td>
</tr>
<tr>
<td>----------------</td>
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<td>----------------</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Semmes Weinstein Monofilaments Test (SW test)</td>
<td>5.9 months</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>1.8(1.8)</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>1.7(1.7)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Tinel's Sign/Test(% positive)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>8.33%</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>3.57%</td>
<td>RR</td>
<td>2.33(0.16, 34.31)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Tinel's Sign/Test(% positive)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>8.33%</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>6.45%</td>
<td>RR</td>
<td>1.29(0.13, 12.96)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Tinel's Sign/Test(% positive)</td>
<td>5.9 months</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>6.45%</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>3.57%</td>
<td>RR</td>
<td>1.81(0.17, 18.86)</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
</tbody>
</table>
TABLE 177: PICO 9- CT RELEASE (SIMULTANEOUS VERSUS STAGED): QUALITY OF LIFE

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fehringer, E.V., 2002</td>
<td>Low Quality</td>
<td>Patient satisfaction (general) (Patient satisfaction (event=those who were not satisfied))</td>
<td>11.8 months</td>
<td>CT release (simultaneous-endoscopic) (Group 2)</td>
<td>48</td>
<td>4.17%</td>
<td>CT release (staged-endoscopic) (Group 1)</td>
<td>48</td>
<td>10.42%</td>
<td>RR</td>
<td>0.40(0.08,1.96)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fehringer, E.V., 2002</td>
<td>Low Quality</td>
<td>Return to Normal Activities (average number of days before return to light duty)</td>
<td>11.8 months</td>
<td>CT release (simultaneous-endoscopic) (Group 2)</td>
<td>48</td>
<td>17.8(,)</td>
<td>CT release (staged-endoscopic) (Group 1)</td>
<td>48</td>
<td>33.7(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Fehringer, E.V., 2002</td>
<td>Low Quality</td>
<td>Return to Normal Activities (average number of days before return to return to Regular Duty)</td>
<td>11.8 months</td>
<td>CT release (simultaneous-endoscopic) (Group 2)</td>
<td>48</td>
<td>82.2(,)</td>
<td>CT release (staged-endoscopic) (Group 1)</td>
<td>48</td>
<td>112.6(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Return to Work (weeks)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>2.25(,)</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>8(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Return to Work (weeks)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>2.25(,)</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>6(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands)) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
</tr>
<tr>
<td>-----------------</td>
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<td>-----------------</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Return to Work (weeks)</td>
<td>5.9 months</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 [62 hands])</td>
<td>31</td>
<td>8(.)</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 [56 hands])</td>
<td>28</td>
<td>6(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 [56 hands]) (P-value&lt;.05)</td>
</tr>
</tbody>
</table>
**TABLE 178: PICO 9- CT RELEASE (SIMULTANEOUS VERSUS STAGED): SYMPTOMS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Questionnaire (General/undefined) (Symptom severity)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>1.4(.)</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>1.4(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Questionnaire (General/undefined) (Symptom severity)</td>
<td>5.9 months</td>
<td>CT release (simultaneous-endoscopic) (12 (24 hands))</td>
<td>12</td>
<td>1.4(.)</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>1.4(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
<tr>
<td>Nesbitt, K.S., 2006</td>
<td>Low Quality</td>
<td>Questionnaire (General/undefined) (Symptom severity)</td>
<td>5.9 months</td>
<td>CT release (staged-endoscopic [1-3 weeks apart]) (31 (62 hands))</td>
<td>31</td>
<td>1.4(.)</td>
<td>CT release (staged-endoscopic [&gt;3 weeks apart]) (28 (56 hands))</td>
<td>28</td>
<td>1.4(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
</tr>
</tbody>
</table>
ANESTHESIA GUIDELINE RECOMMENDATIONS

A. LOCAL VERSUS INTRAVENOUS (IV) REGIONAL ANESTHESIA
Limited evidence supports the use of local anesthesia rather than intravenous regional anesthesia (Bier block) because it might offer longer pain relief after carpal tunnel release; no evidence meeting our inclusion criteria was found comparing general anesthesia to either regional or local anesthesia for carpal tunnel surgery.

Strength of Recommendation: Limited Evidence ★★★★

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

RATIONALE
There were two moderate quality studies comparing local anesthesia to intravenous regional anesthesia. Nabhan (2011) studied 43 patients randomized to receive either local anesthesia or intravenous regional anesthesia using prilocaine. Three patients in the intravenous regional anesthesia group and one patient in the local anesthesia group required supplementation with additional local infiltration at the surgery site. The tourniquet was inflated longer in the intravenous regional anesthesia group but the operating time was the same in both groups. There were no other differences between the groups.

Sorensen et al (2013) randomized 38 patients to have endoscopic carpal tunnel release under either local anesthesia with ropivacaine or intravenous regional anesthesia with mepivacaine. The group treated with local anesthesia had less pain at the end of the procedure as well as two hours after surgery was completed although pain during the procedure was equal in the two groups.

Risks and Harms of Implementing this Recommendation
The main concern with the local infiltration of anesthetic agents is the well-documented cardiotoxicity of bupivacaine³.

FUTURE RESEARCH STATEMENT
No evidence meeting our inclusion criteria was found specifically comparing local anesthesia to either general anesthesia or regional anesthesia using brachial plexus blocks. Studies evaluating the role of regional anesthesia administered via brachial plexus block might be valuable given the post-operative analgesia conferred by these methods. In the existing literature the main advantage of local infiltration compared with intravenous regional anesthesia was post-operative pain relief for up to two hours.

B. BUFFERED VERSUS PLAIN LIDOCAINE
Moderate evidence supports the use of buffered lidocaine rather than plain lidocaine for local anesthesia because it could result in less injection pain.
Strength of Recommendation: Moderate Evidence

Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

RATIONALE
There were two high quality studies evaluating the use of buffered lidocaine for local anesthesia. Vossinakis et al (2004) studied 21 patients undergoing sequential, bilateral carpal tunnel release under local anesthesia. In each case one hand was anesthetized with lidocaine buffered with sodium bicarbonate and the other hand with plain lidocaine. Following infiltration the patients reported pain on a 100 mm visual analog scale. Those receiving the buffered solution reported less pain and the difference between the groups was statistically significant.

Watts et al (2004) randomized 64 patients to have a carpal tunnel release under local anesthesia using either plain lidocaine or lidocaine buffered with sodium bicarbonate. One minute after infiltration, and before application of a tourniquet, pain was measured on a 100 mm visual analog scale. Although patients who received buffered lidocaine reported less pain, the difference from those receiving the plain lidocaine was not statistically significant.

Risks and Harms of Implementing this Recommendation
The main concern with the local infiltration of anesthetic agents is the well-documented cardiotoxicity of bupivacaine.

FUTURE RESEARCH STATEMENT
No evidence meeting our inclusion criteria was found specifically comparing local anesthesia to either general anesthesia or regional anesthesia using brachial plexus blocks. Studies evaluating the role of regional anesthesia administered via brachial plexus block might be valuable given the post-operative analgesia conferred by these methods. In the existing literature the main advantage of local infiltration compared with intravenous regional anesthesia was post-operative pain relief for up to two hours.
## STUDY QUALITY TABLE OF SURGICAL ANESTHETIC

### TABLE 179: OBSERVATIONAL STUDY QUALITY

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomaino, M.M., 2001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>○</td>
<td>○</td>
<td>•</td>
<td></td>
<td>•</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>

### TABLE 180: RANDOMIZED TRIAL QUALITY

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nabhan, A., 2011</td>
<td>○</td>
<td>•</td>
<td>•</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
<td>•</td>
<td>•</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Sorensen, A.M., 2013</td>
<td>○</td>
<td>•</td>
<td>•</td>
<td>○</td>
<td>○</td>
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<td></td>
<td>•</td>
<td>•</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Vossinakis, I.C., 2004</td>
<td>○</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
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<td>•</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Watts, A.C., 2004</td>
<td>○</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td></td>
<td>•</td>
<td>•</td>
<td>Include</td>
<td>High Quality</td>
</tr>
</tbody>
</table>
RESULTS

SUMMARY OF DATA FINDINGS

TABLE 181: SUMMARY OF FINDINGS PICO 11 PART 1 MODES OF ANALGESIA: LOCAL VS LOCAL (EARLY FOLLOW-UP (PRE-OP/INTRA-OP))

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>High Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors treatment 1</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Favors treatment 2</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Not significant</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Vossinakis, I.C., 2004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watts, A.C., 2004</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pain: Questionnaire/Scale (VAS-pain)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10 (at 0.5 minutes)</td>
<td>✔️</td>
</tr>
<tr>
<td>Burning pain, 0-10 (at 0.5 minutes)</td>
<td>✔️</td>
</tr>
<tr>
<td>Pain 1 minute after injection, (0-100) (at 2 minutes)</td>
<td>✔️</td>
</tr>
<tr>
<td>Stinging pain, 0-10 (at 0.5 minutes)</td>
<td>☐</td>
</tr>
<tr>
<td>Tension pain, 0-10 (at 0.5 minutes)</td>
<td>☐</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>Moderate Quality</th>
<th>Low Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors treatment 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Favors treatment 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not significant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td><strong>Function</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaire (MHQ-hand function)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand function (Michigan Hand Outcomes Questionnaire, 0-100)</td>
<td>0</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety during anesthetic administration, 0-10</td>
<td>0</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaire (MHQ-pain)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain (Michigan Hand Outcomes Questionnaire, 0-100)</td>
<td>0</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaire/Scale (VAS-pain)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10</td>
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<tr>
<td>0min</td>
<td>□</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20min</td>
<td>□</td>
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<td></td>
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<tr>
<td>Pain during anesthetic administration, 0-10</td>
<td>0</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain during surgery, 0-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30min</td>
<td>□</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain related to tourniquet, 0-10</td>
<td>0</td>
<td>□</td>
<td></td>
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<tr>
<td><strong>Quality Of Life</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Questionnaire (MHQ-activity of daily living)</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Activity of daily living (Michigan Hand Outcomes Questionnaire, 0-100)</td>
<td>0</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaire (MHQ-patient satisfaction)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient satisfaction (Michigan Hand Outcomes Questionnaire, 0-100)</td>
<td>0</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaire (MHQ-work performance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work performance (Michigan Hand Outcomes Questionnaire, 0-100)</td>
<td>0</td>
<td>□</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 183: SUMMARY OF FINDINGS PICO 11 PART 2 MODES OF ANALGESIA: LOCAL VS REGIONAL (LATE FOLLOW-UP (POST-OP))

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Moderate Quality</th>
<th>Low Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors treatment 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not significant</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Function                                                                 |                  |             |               |
| Questionnaire (MHQ-hand function)                                        |                  |             |               |
| Hand function (Michigan Hand Outcomes Questionnaire, 0-100)              |                  |             |               |
| 14 days                                                                  | ○                |             |               |
| 180 days                                                                 | ○                |             |               |
| Pain                                                                     |                  |             |               |
| Questionnaire (MHQ-pain)                                                 |                  |             |               |
| Pain (Michigan Hand Outcomes Questionnaire, 0-100)                       |                  |             |               |
| 14 days                                                                  | ○                |             |               |
| 180 days                                                                 | ○                |             |               |
| Questionnaire/Scale (VAS-pain)                                           |                  |             |               |
| 0-10                                                                     |                  |             |               |
| 40mins                                                                   | ○                |             |               |
| 2hrs                                                                     | ○                |             |               |
| 24hrs                                                                    | ○                |             |               |
| Quality Of Life                                                          |                  |             |               |
| Questionnaire (MHQ-activity of daily living)                             |                  |             |               |
| Activity of daily living (Michigan Hand Outcomes Questionnaire, 0-100)   |                  |             |               |
| 14 days                                                                  | ○                |             |               |
| 180 days                                                                 | ○                |             |               |
| Questionnaire (MHQ-patient satisfaction)                                 |                  |             |               |
| Patient satisfaction (Michigan Hand Outcomes Questionnaire, 0-100)       |                  |             |               |
| 14 days                                                                  | ○                |             |               |
| 180 days                                                                 | ○                |             |               |
| Questionnaire (MHQ-work performance)                                     |                  |             |               |
| Work performance (Michigan Hand Outcomes Questionnaire, 0-100)           |                  |             |               |
| 14 days                                                                  | ○                |             |               |
| 180 days                                                                 | ○                |             |               |
| Questionnaire/Scale (VAS-patient satisfaction)                           |                  |             |               |
| Patient satisfaction with anesthesia                                     |                  |             |               |
| 90 days                                                                  | ○                |             |               |

Note: ○ indicates evidence favoring treatment 1; □ indicates evidence favoring treatment 2; ○ represents not significant.
**DETAILED DATA FINDINGS**

**TABLE 184: PICO 11 PART 1 - LOCAL VERSUS LOCAL: PAIN**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vossinakis, I.C., 2004</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(0-10)</td>
<td>0.5 min (Intra-Op)</td>
<td>Local (lidocaine) (15mL 1% lidocaine + adrenaline 1:200,000)</td>
<td>21</td>
<td>7.6(0.80)</td>
<td>Local (lidocaine-buffered) (15mL 1% lidocaine + adrenaline 1:200,000 buffered 8.4% sodium bicarbonate)</td>
<td>21</td>
<td>3.6(0.50)</td>
<td>Mean Difference</td>
<td>4(3.60,4.403498)</td>
<td>Local (lidocaine-buffered) (15mL 1% lidocaine + adrenaline 1:200,000 buffered 8.4% sodium bicarbonate) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Vossinakis, I.C., 2004</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)(burning pain, 0-10)</td>
<td>0.5 min (Intra-Op)</td>
<td>Local (lidocaine) (15mL 1% lidocaine + adrenaline 1:200,000)</td>
<td>21</td>
<td>7.5(2.30)</td>
<td>Local (lidocaine-buffered) (15mL 1% lidocaine + adrenaline 1:200,000 buffered 8.4% sodium bicarbonate)</td>
<td>21</td>
<td>2.3(1.30)</td>
<td>Mean Difference</td>
<td>5.2(4.07,6.329988)</td>
<td>Local (lidocaine-buffered) (15mL 1% lidocaine + adrenaline 1:200,000 buffered 8.4% sodium bicarbonate) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference</td>
<td>Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
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<tr>
<td>Vossinakis, I.C., 2004</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain) (stinging pain, 0-10)</td>
<td>0.5 min (Intra-Op)</td>
<td>Local (lidocaine) (15mL 1% lidocaine + adrenaline 1:200,000)</td>
<td>21</td>
<td>2.3(1.00)</td>
<td>Local (lidocaine-buffered) (15mL 1% lidocaine + adrenaline 1:200,000 buffered 8.4% sodium bicarbonate)</td>
<td>21</td>
<td>2.4(0.80)</td>
<td>Mean Difference</td>
<td>-0.1(-0.65,0.447732)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Vossinakis, I.C., 2004</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain) (Tension pain, 0-10)</td>
<td>0.5 min (Intra-Op)</td>
<td>Local (lidocaine) (15mL 1% lidocaine + adrenaline 1:200,000)</td>
<td>21</td>
<td>3.6(0.70)</td>
<td>Local (lidocaine-buffered) (15mL 1% lidocaine + adrenaline 1:200,000 buffered 8.4% sodium bicarbonate)</td>
<td>21</td>
<td>3.5(0.50)</td>
<td>Mean Difference</td>
<td>0.1(-0.27,0.467927)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Watts, A.C., 2004</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain) (Pain 1 minute after injection, 0-100)</td>
<td>2 min (Intra-Op)</td>
<td>Local (lidocaine-buffered) (2% lidocaine buffered with sodium bicarbonate)</td>
<td>32</td>
<td>17.3(2.70)</td>
<td>Local (lidocaine-not buffered) (2% plain lidocaine + sodium chloride)</td>
<td>32</td>
<td>20(2.30)</td>
<td>Mean Difference</td>
<td>-2.7(-3.93,-1.47108)</td>
<td>Local (lidocaine-buffered) (2% lidocaine buffered with sodium bicarbonate) (P-value&lt;.05)</td>
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**TABLE 185: PICO 11 PART 2 - LOCAL VERSUS REGIONAL: FUNCTION**

<table>
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<th>Reference Title</th>
<th>Quality</th>
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<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nabhan, A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-hand function) (Hand function (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>NA (Pre-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>58(0)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>56(0)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Nabhan, A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-hand function) (Hand function (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>2 weeks (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>75(0)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>74(0)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Nabhan, A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-hand function) (Hand function (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>6 months (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>94(0)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>91(0)</td>
<td>Author Reported</td>
<td>NA</td>
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TABLE 186: PICO 11 PART 2- LOCAL VERSUS REGIONAL: OTHER

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<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomaino, M.M., 2001</td>
<td>Low Quality</td>
<td>Anxiety (Anxiety during anesthetic administration, 0-10)</td>
<td>0 (Pre-Op)</td>
<td>Regional (lidocaine) (IVRA with lidocaine)</td>
<td>15</td>
<td>1(+)</td>
<td>Local (lidocaine) (LA with lidocaine)</td>
<td>15</td>
<td>0(+)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt; .05)</td>
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</tr>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-pain) (Pain (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>NA (Pre-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>56(,)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>66(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-pain) (Pain (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>2 weeks (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>15(,)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>17(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-pain) (Pain (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>6 months (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>11(,)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>15(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain) (pain related to tourniquet, 0-10)</td>
<td>Intra-Op</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>4.6(0.90)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>4.5(1.60)</td>
<td>Mean Difference</td>
<td>0.1(-0.68,0.880864)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sorensen,A.M., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain) (0-10)</td>
<td>0 min (Intra-Op)</td>
<td>Local (ropivacain) (7.5mg/ml Ropivacaine 10ml total)</td>
<td>19</td>
<td>1.2(2.00)</td>
<td>Regional (mepivacaine) (1% Mepivacaine)</td>
<td>19</td>
<td>1.4(2.30)</td>
<td>Mean Difference</td>
<td>-0.2(-1.57,1.170525)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sorensen,A.M., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain) (0-10)</td>
<td>40 min (Post-Op)</td>
<td>Local (ropivacain) (7.5mg/ml Ropivacaine 10ml total)</td>
<td>19</td>
<td>0.2(0.60)</td>
<td>Regional (mepivacaine) (1% Mepivacaine)</td>
<td>19</td>
<td>1.4(1.80)</td>
<td>Mean Difference</td>
<td>-1.2(-2.05,-0.34683)</td>
<td>Local (ropivacain) (7.5mg/ml Ropivacaine 10ml total) (P-value&lt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Sorensen,A.M., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain)(0-10)</td>
<td>20 min (Peri-Op)</td>
<td>Local (ropivacaine) (7.5mg/ml Ropivacaine 10ml total)</td>
<td>19</td>
<td>2.9(1.40)</td>
<td>Regional (mepivacaine) (1% Mepivacaine)</td>
<td>19</td>
<td>3.6(2.70)</td>
<td>Mean Difference</td>
<td>-0.7(-2.07,0.667571)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Sorensen,A.M., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain)(0-10)</td>
<td>2 hours (Post-Op)</td>
<td>Local (ropivacaine) (7.5mg/ml Ropivacaine 10ml total)</td>
<td>19</td>
<td>0.2(0.50)</td>
<td>Regional (mepivacaine) (1% Mepivacaine)</td>
<td>19</td>
<td>1.4(1.80)</td>
<td>Mean Difference</td>
<td>-1.2(-2.04,-0.35997)</td>
<td>Local (ropivacaine) (7.5mg/ml Ropivacaine 10ml total) (P-value&lt;.05)</td>
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<tr>
<td>Sorensen,A.M., 2013</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain)(0-10)</td>
<td>24 hours (Post-Op)</td>
<td>Local (ropivacaine) (7.5mg/ml Ropivacaine 10ml total)</td>
<td>19</td>
<td>1.3(2.30)</td>
<td>Regional (mepivacaine) (1% Mepivacaine)</td>
<td>19</td>
<td>1.1(1.70)</td>
<td>Mean Difference</td>
<td>0.2(-1.09,1.486044)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Tomaino,M.M., 2001</td>
<td>Low Quality</td>
<td>Questionnaire/Scale (VAS-pain)(pain during anesthetic administration, 0-10)</td>
<td>0 (Pre-Op)</td>
<td>Regional (lidocaine) (IVRA with lidocaine)</td>
<td>15</td>
<td>1(.)</td>
<td>Local (lidocaine) (LA with lidocaine)</td>
<td>15</td>
<td>2(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Tomaino,M.M., 2001</td>
<td>Low Quality</td>
<td>Questionnaire/Scale (VAS-pain)(Pain during surgery, 0-10)</td>
<td>30 min (Intra-Op)</td>
<td>Regional (lidocaine) (IVRA with lidocaine)</td>
<td>15</td>
<td>1(.)</td>
<td>Local (lidocaine) (LA with lidocaine)</td>
<td>15</td>
<td>3(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-activity of daily living) (Activity of daily living (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>NA (Pre-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>67(.)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>63(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-activity of daily living) (Activity of daily living (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>2 weeks (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>85(.)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>89(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-activity of daily living) (Activity of daily living (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>6 months (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>95(.)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>95(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-patient satisfaction) (Patient satisfaction (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>NA (Pre-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>32(.)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>36(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
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<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favorable Treatment</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-patient satisfaction)(Patient satisfaction (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>2 weeks (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>85(.)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>79(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-patient satisfaction)(Patient satisfaction (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>6 months (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>88(.)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>85(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-work performance)(Work performance (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>NA (Pre-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>55(.)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>52(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate Quality</td>
<td>Questionnaire (MHQ-work performance)(Work performance (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>2 weeks (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>78(.)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>80(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Nabhan,A., 2011</td>
<td>Moderate</td>
<td>Questionnaire (MHQ-work performance) (Work performance (Michigan Hand Outcomes Questionnaire, 0-100))</td>
<td>6 months (Post-Op)</td>
<td>Local (10ml of 1% prilocaine) (LA-20ml prilocaine)</td>
<td>22</td>
<td>89(,)</td>
<td>Regional (30 ml of 1% prilocaine) (IVRA-30mL 1% prilocaine)</td>
<td>21</td>
<td>87(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Tomaino,M.M., 2001</td>
<td>Low</td>
<td>Questionnaire/Scale (VAS-patient satisfaction) (patient satisfaction with anesthesia)</td>
<td>90 days (Post-Op)</td>
<td>Regional (lidocaine) (IVRA with lidocaine)</td>
<td>15</td>
<td>1(,)</td>
<td>Local (lidocaine) (LA with lidocaine)</td>
<td>15</td>
<td>3(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
ASPIRIN USE
Limited evidence supports that the patient might continue the use of aspirin perioperatively; no evidence meeting our inclusion criteria addressed other anticoagulants.

Strength of Recommendation: Limited Evidence  ★★★★
Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

Rationale
One low quality study (Brunetti 2013) met our inclusion criteria. This study examined only aspirin use that was either continued or stopped five days before surgery and resumed three days postoperatively. Compared with controls that were not on aspirin, there were no differences in either hematoma formation or other general complications. There is no evidence meeting our criteria on any other anticoagulant therapies.

Risks and Harms of Implementing this Recommendation
There is a potential risk of bleeding in patients who undergo surgical procedures while on anticoagulants.

Future Research
Investigate anticoagulant use in carpal tunnel surgery using different types of anesthesia and with and without the use of a tourniquet as well. More data is needed on other anticoagulant types including NSAIDs.
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunetti, S., 2013</td>
<td>ⓜ</td>
<td>ⓚ</td>
<td>ⓚ</td>
<td>ⓜ</td>
<td>ⓜ</td>
<td>ⓜ</td>
<td>ⓚ</td>
<td>ⓚ</td>
<td>ⓚ</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>
## RESULTS

### SUMMARY OF DATA FINDINGS

**TABLE 190: SUMMARY OF FINDINGS PICO 12 PERI-OPERATIVE ANTICOAGULATION CESSATION**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Favors treatment 1</td>
<td></td>
<td></td>
<td></td>
<td>Low Quality</td>
</tr>
<tr>
<td>Favors treatment 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not significant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complications (general)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>NA</td>
</tr>
<tr>
<td>Complications (haematomata)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>NA</td>
</tr>
</tbody>
</table>
## DETAILED DATA FINDINGS

**TABLE 191: PICO 12- ANTI COAGULATION: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Treatment 2 (Details)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunetti,S., 2013</td>
<td>Low Quality</td>
<td>Complications (general)(Combination of major+minor complications)</td>
<td>3 months</td>
<td>Group 2 (stop aspirin) (Aspirin stopped at least 5 d before surgery and resumed 3 d after)</td>
<td>Group 3 (never antiaggregated) (Patients did not take aspirin)</td>
<td>RR</td>
<td>1.00(0.06,15.55)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Brunetti,S., 2013</td>
<td>Low Quality</td>
<td>Complications (general)(Combination of major+minor complications)</td>
<td>3 months</td>
<td>Anticoagulation (continued) (Non-stop Aspirin for 1 year)</td>
<td>Anticoagulation (cessation) (Aspirin stopped at least 5 d before surgery and resumed 3 d after)</td>
<td>RR</td>
<td>1.00(0.06,15.55)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Brunetti,S., 2013</td>
<td>Low Quality</td>
<td>Complications (general)(Combination of major+minor complications)</td>
<td>3 months</td>
<td>Anticoagulation (continued) (Non-stop Aspirin for 1 year)</td>
<td>No anticoagulation (Patients did not take aspirin)</td>
<td>RR</td>
<td>1.00(0.06,15.55)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Brunetti,S., 2013</td>
<td>Low Quality</td>
<td>Complications (haematoma)(Major+minor Haematoma combined)</td>
<td>3 months</td>
<td>Group 2 (stop aspirin) (Aspirin stopped at least 5 d before surgery and resumed 3 d after)</td>
<td>Group 3 (never antiaggregated) (Patients did not take aspirin)</td>
<td>RR</td>
<td>1.13(0.47,2.68)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------</td>
<td>-----------------</td>
<td>----------</td>
<td>-----------------------</td>
<td>----------</td>
<td>---------------</td>
<td>-----------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Brunetti,S., 2013</td>
<td>Low Quality</td>
<td>Complications (haematoma)(Major+minor Haematoma combined)</td>
<td>3 months</td>
<td>Anticoagulation (continued) (Non-stop Aspirin for 1 year)</td>
<td>50</td>
<td>20.00%</td>
<td>Anticoagulation (cessation) (Aspirin stopped at least 5 d before surgery and resumed 3 d after)</td>
<td>50</td>
</tr>
<tr>
<td>Brunetti,S., 2013</td>
<td>Low Quality</td>
<td>Complications (haematoma)(Major+minor Haematoma combined)</td>
<td>3 months</td>
<td>Anticoagulation (continued) (Non-stop Aspirin for 1 year)</td>
<td>50</td>
<td>20.00%</td>
<td>No anticoagulation (Patients did not take aspirin)</td>
<td>50</td>
</tr>
</tbody>
</table>
PREOPERATIVE ANTIBIOTICS
Limited evidence supports that there is no benefit for routine use of prophylactic antibiotics prior to carpal tunnel release because there is no demonstrated reduction in postoperative surgical site infection.

Strength of Recommendation: Limited Evidence ★★★★

Description: Evidence from one or more “Low” quality studies with consistent findings or evidence from a single “Moderate” quality study recommending for or against the intervention or diagnostic test or the evidence is insufficient or conflicting and does not allow a recommendation for or against the intervention.

Rationale
There were two low quality studies (Harness, Tosti) which evaluated the use of prophylactic antibiotics in carpal tunnel release. Neither study showed a statistically significant difference between the groups receiving prophylactic antibiotics and those not receiving antibiotics. There is insufficient evidence to support the routine use of prophylactic antibiotics to prevent surgical site infections in carpal tunnel release.

Risks and Harms of Implementing this Recommendation
Routine use of prophylactic antibiotics is not without consequence. Financial cost, anaphylaxis, development of antibiotic resistance, and changes in microbiome population are all factors

Future Research
Future research should consider reporting on the associated cost, value, and quality of life as they relate to antibiotics. Future research should also focus on the efficacy of preoperative antibiotic treatment in diabetics and/or other immunocompromised populations.
<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participant Recruitment</th>
<th>Allocation</th>
<th>Confounding Variables</th>
<th>Follow-Up Length</th>
<th>Other Bias? (If retrospective comparative, mark Yes)</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harness,N.G., 2010</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
<tr>
<td>Tosti,R., 2012</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>Include</td>
<td>Low Quality</td>
</tr>
</tbody>
</table>
RESULTS

SUMMARY OF DATA FINDINGS

TABLE 193: SUMMARY OF FINDINGS PICO 13 PROPHYLACTIC ANTIBIOTICS

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Favors treatment 1</th>
<th>Favors treatment 2</th>
<th>Not significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Quality</td>
<td>Harness, N.G., 2010</td>
<td>Tosti, R., 2012</td>
<td>Meta-Analysis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Complications</th>
<th>Favors treatment 1</th>
<th>Not significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical site infection</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

NA
## DETAILED DATA FINDINGS

### TABLE 194: PICO 13- PROPHYLACTIC ANTIBIOTICS: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harness,N.G., 2010</td>
<td>Low Quality</td>
<td>Surgical site infection( )</td>
<td>1 month</td>
<td>Patients Without Prophylactic Antibiotics (No prophylactic antibiotics)</td>
<td>917</td>
<td>0.65%</td>
<td>Patients With Prophylactic Antibiotics (Prophylactic antibiotics)</td>
<td>1419</td>
<td>0.35%</td>
<td>RR</td>
<td>1.86(0.57,6.07)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
<tr>
<td>Tosti,R., 2012</td>
<td>Low Quality</td>
<td>Surgical site infection( )</td>
<td>1 month</td>
<td>Patients Without Prophylactic Antibiotics ( )</td>
<td>198</td>
<td>1.01%</td>
<td>Patients With Prophylactic Antibiotics ( )</td>
<td>102</td>
<td>0.98%</td>
<td>RR</td>
<td>1.03(0.09,11.23)</td>
<td>Not Significant (P-value&gt;0.05)</td>
</tr>
</tbody>
</table>
SUPERVISED VERSUS HOME THERAPY
Moderate evidence supports no additional benefit to routine supervised therapy over home programs in the immediate postoperative period. No evidence meeting the inclusion criteria was found comparing the potential benefit of exercise versus no exercise after surgery.

Strength of Recommendation: Moderate Evidence ★★★★★
Description: Evidence from two or more “Moderate” quality studies with consistent findings, or evidence from a single “High” quality study for recommending for or against the intervention.

Rationale
Routine post-operative therapy after carpal tunnel release was examined in 6 high quality studies. From these, two studies (Hochberg 2001 and Jerosch-Herold 2012) addressed interventions not relevant to current core practices of postoperative rehabilitation. The remaining four studies (Alves 2011, Fagan 2004, Pomerance 2007, and Provinciali 2000) addressed the need for supervised therapy in addition to a home program in the early postoperative period, the early use of laser, or the role of sensory reeducation in the later stages of recovery.

One high quality study (Alves 2011) evaluated the use of laser administered to the carpal tunnel in 10 daily consecutive sessions at a 3J dosage and found no difference in pain/symptom reoccurrence in comparison to placebo.

Two moderate quality studies (Pomerance 2007 and Provinciali 2000) compared in-clinic or therapist supervised exercise programs in addition to a home program to a home program alone. The studies were somewhat limited by an incomplete description of who delivered home programs, exercise/education content and dosage, and treatment progression. Pomerance (2007) compared a two week program directed by a therapist combined with a home program alone and found no additional benefit in terms of grip or pinch strength in comparison to the home program alone. Provinciali (2000) compared one hour sessions over 10 consecutive days of in-clinic physiotherapy comprising a multimodal program with a home program that was progressed in terms of strength/endurance. No benefit was found in outcome when measured by a CTS-specific patient reported instrument.

Risks and Harms of Implementing this Recommendation
There is no known harm to implementing this recommendation.

Future Research
More trials comparing different approaches are needed. These studies should include validated measures of patient-reported outcomes, impairment, adherence and costs. Better description of the characteristics of the exercise and education content, provider and delivery are needed. Studies that address how to identify subsets that need different approaches (treatment-based prediction rules) or targeting of interventions based on different surgical approaches, patient presentations or individual circumstances are also needed.
### STUDY QUALITY TABLE OF POST-OPERATIVE THERAPY

**TABLE 195. INTERVENTION QUALITY EVALUATIONS**

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alves, M.P.T., 2011</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Fagan, D.J., 2004</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Jerosch-Herold, C., 2012</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
<tr>
<td>Pomerance, J., 2007</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Include</td>
<td>High Quality</td>
</tr>
<tr>
<td>Provinciali, L., 2000</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Include</td>
<td>Moderate Quality</td>
</tr>
</tbody>
</table>
### RESULTS

**SUMMARY OF DATA FINDINGS**

**TABLE 196: SUMMARY OF FINDINGS PICO 14 POST-OP THERAPY (EARLY FOLLOW-UP (< 1 MONTH))**

<table>
<thead>
<tr>
<th></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Favors treatment 1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Favors treatment 2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Not significant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Outcomes</strong></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom occurrence (pillar pain)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Symptom occurrence (scar pain)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Complications</strong></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom occurrence (pillar pain)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Symptom occurrence (scar pain)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Function</strong></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grip Strength</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Pinch Strength</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Questionnaire (General/Undefined)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Boston CT score-walking with numbness</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Functional sensibility (locognosia test)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Functional sensibility (Shape-Texture Identification (STI) test)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>0 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>28 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Functional sensibility (Weinstein Enhanced Sensory Test (WEST))</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>0 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>28 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Moberg pick-up test</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>0 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>28 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Two-point discrimination</strong></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional sensibility (static two point discrimination (2PD))</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>0 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>28 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>56 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Other</strong></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median nerve swelling</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Questionnaire (General/undefined)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Boston CT score-duration of episode</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Questionnaire (DASH)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Pain</strong></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire (General/undefined)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Boston CT score-daytime pain</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Boston CT score-recurrence of pain</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Boston CT score-severity of pain</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Boston CT score-waking with pain</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>VAS, 0-10</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>0 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>3 days</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Questionnaire/Scale (VAS-pain)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Symptom recurrence (palmar pain)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Quality Of Life</strong></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return to Work</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Symptoms</strong></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire (General/undefined)</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Boston CT score-numbness</td>
<td></td>
<td></td>
<td>NA</td>
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<tr>
<td>Boston CT score-severity of numbness</td>
<td></td>
<td></td>
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<tr>
<td>Boston CT score-tingling sensation</td>
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<td></td>
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<tr>
<td>Boston CT score-weakness</td>
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<tr>
<td>Symptom recurrence (Night time pain)</td>
<td></td>
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<td>Favors treatment 1</td>
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<td>Moderate Quality</td>
<td>Meta-Analysis</td>
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<tr>
<td>Not significant</td>
<td>Provincial M., 2000</td>
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<td></td>
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</tbody>
</table>

### Outcomes

| Complications | Symptom occurrence (pillar pain) | | | |
|----------------|----------------------------------|-----------------|-----------------|
| 60 days | | | |
| 90 days | | | |
| 180 days | | | |

| Symptom occurrence (scar pain) | | | |
| 60 days | | | |
| 90 days | | | |
| 180 days | | | |

| Function | Grip strength | | |
| Pinch Strength | | | |

| Questionnaire (General/Undefined) | Boston CT score-walking with numbness | Functional sensibility (locognosia test) | Functional sensibility (Shape-Texture Identification (STI) test) |
| 17.5 months | | | |
| 18.5 months | | | |
| 19.5 months | | | |

| Functional sensibility (Weinstein Enhanced Sensory Test (WEST)) | | |
| 17.5 months | | |
| 18.5 months | | |
| 19.5 months | | |

| Moberg pick-up test | Functional sensibility | | |
| 17.5 months | | | |
| 18.5 months | | | |
| 19.5 months | | | |

| Two-point discrimination | | |
| 17.5 months | | |
| 18.5 months | | |
| 19.5 months | | |

| Other | Questionnaire (General/Undefined) | | |
| Boston CT score-duration of episode | | | |
| Questionnaire (DASH) | | | |

| Pain | Questionnaire (General/Undefined) | | |
| Boston CT score-daytime pain | | | |
| Boston CT score-recurrence of pain | | | |
| Boston CT score-severity of pain | | | |
| Boston CT score-waking with pain | | | |

| Symptom recurrence (palmar pain) | | |
| 60 days | | |
| 90 days | | |
| 180 days | | |

| Quality Of Life | Return to Work | | |
| | | | |

| Symptoms | Questionnaire (General/Undefined) | | |
| Boston CT score-numbness | | | |
| Boston CT score-severity of numbness | | | |
| Boston CT score-tingling sensation | | | |
| Boston CT score-weakness | | | |

| Symptom recurrence (night time pain) | | | |
| | | | |
| Symptom recurrence (numbness) | | | |
## DETAILED DATA FINDINGS

### TABLE 198: PICO 14- POST-OP THERAPY: COMPLICATIONS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
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<tbody>
<tr>
<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (pillar pain)( )</td>
<td>1 month</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>27.59%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>20.69%</td>
<td>RR</td>
<td>1.33(0.53,3.36)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Alves,M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (pillar pain)( )</td>
<td>2 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>13.79%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>24.14%</td>
<td>RR</td>
<td>0.57(0.19,1.74)</td>
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<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (pillar pain)</td>
<td>3 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>13.79%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>20.69%</td>
<td>RR</td>
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<td>Alves,M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (pillar pain)</td>
<td>5.9 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>3.45%</td>
<td>RD</td>
<td>-0.03(-0.10,0.03)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Alves,M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (scar pain)( )</td>
<td>1 month</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>31.03%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
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<td>55.17%</td>
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<td>Alves, M.P.T., 2011</td>
<td>Moderate</td>
<td>Symptom occurrence (scar pain)</td>
<td>2 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>10.34%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>20.69%</td>
<td>RR</td>
<td>0.50 (0.14, 1.81)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (scar pain)</td>
<td>3 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>3.45%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>10.34%</td>
<td>RR</td>
<td>0.33 (0.04, 3.02)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<tr>
<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (scar pain)</td>
<td>5.9 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>3.45%</td>
<td>RD</td>
<td>-0.03(-0.10,0.03)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Reference Title</td>
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<tr>
<td>Pomerance, J., 2007</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>2 weeks</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>19.1 (10.60)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>19.8 (10.00)</td>
<td>Mean Difference</td>
<td>-0.7 (-4.00, 2.601817)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>1 month</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>24.9 (9.00)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>23.8 (9.90)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>1.4 months</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>24.8 (9.20)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>24.7 (9.00)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Pomerance, J., 2007</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>3 months</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>26.8 (9.80)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>26.6 (8.80)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Pomerance, J., 2007</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>5.9 months</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>26.2(10.00)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>26.6(9.90)</td>
<td>Mean Difference</td>
<td>-0.4(-3.59,2.786263)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Pomerance, J., 2007</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>2 weeks</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>4.1(2.30)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>4.8(2.20)</td>
<td>Mean Difference</td>
<td>-0.7(-1.42,0.021010)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Pomerance, J., 2007</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>1 month</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>5.6(2.00)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>5.6(2.20)</td>
<td>Mean Difference</td>
<td>0(-0.67,0.672287)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Pomerance, J., 2007</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>1.4 months</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>6.9(2.50)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>7(2.40)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Pomerance, J., 2007</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>3 months</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>7.5(2.30)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>7.7(2.50)</td>
<td>Mean Difference</td>
<td>-0.2(-0.97,0.568246)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Pomerance, J., 2007</td>
<td>High Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>5.9 months</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>7.6(2.30)</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>7.8(2.30)</td>
<td>Mean Difference</td>
<td>-0.2(-0.94,0.536415)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Jerosch-Herold, C., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Functional sensibility (locognosia test))</td>
<td>17.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>16</td>
<td>41(12.94)</td>
<td>No further treatment (No further treatment)</td>
<td>15</td>
<td>42.8(8.14)</td>
<td>Mean Difference</td>
<td>-1.8(-9.36,5.761265)</td>
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<td>Jerosch-Herold, C., 2012</td>
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<td>Questionnaire (General/undefined) (Functional sensibility (Shape-Texture Identification (STI) test))</td>
<td>17.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>16</td>
<td>3.38(1.69)</td>
<td>No further treatment (No further treatment)</td>
<td>15</td>
<td>2.67(1.99)</td>
<td>Mean Difference</td>
<td>0.7(-0.59,2.013824)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Quality</td>
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<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate</td>
<td>Questionnaire (General/undefined)(Functional sensibility (Weinstein Enhanced Sensory Test (WEST)))</td>
<td>17.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>16</td>
<td>2.53(0.94)</td>
<td>No further treatment (No further treatment)</td>
<td>15</td>
<td>2.37(0.40)</td>
<td>Mean Difference</td>
<td>0.16(-0.34,0.663119)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Jerosch-Herold,C., 2012</td>
<td>Moderate</td>
<td>Questionnaire (General/undefined)(Moberg pick-up test)</td>
<td>17.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>16</td>
<td>3.72(0.57)</td>
<td>No further treatment (No further treatment)</td>
<td>15</td>
<td>3.88(0.53)</td>
<td>Mean Difference</td>
<td>-0.16(-0.55,0.227232)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Jerosch-Herold,C., 2012</td>
<td>Moderate</td>
<td>Questionnaire (General/undefined)(Functional sensibility (locognosia test))</td>
<td>18.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>13</td>
<td>48.85(6.91)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>43.15(8.05)</td>
<td>Mean Difference</td>
<td>5.7(-0.07,11.46711)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Functional sensibility (Shape-Texture Identification (STI) test))</td>
<td>18.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>13</td>
<td>4.92(1.38)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>3.31(1.93)</td>
<td>Mean Difference</td>
<td>1.61(0.32, 2.899767)</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program) (P-value&lt;.05)</td>
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<td>Jerosch-Herold,C., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Functional sensibility (Weinstein Enhanced Sensory Test (WEST)))</td>
<td>18.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
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<td>3.08(0.64)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>2.54(0.52)</td>
<td>Mean Difference</td>
<td>0.54(0.09, 0.988269)</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program) (P-value&lt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
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<td>Mean1/P 1 (SD1)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Mobeg pick-up test)</td>
<td>18.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>13</td>
<td>3.36(0.22)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>3.97(0.37)</td>
<td>Mean Difference</td>
<td>-0.61(-0.84,-0.37599)</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program) (P-value&lt;.05)</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Functional sensibility (locognosia test))</td>
<td>19.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>11</td>
<td>49.46(5.05)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>43.39(11.08)</td>
<td>Mean Difference</td>
<td>6.07(-0.65,12.79196)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Functional sensibility (Shape-Texture Identification (STI) test))</td>
<td>19.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>11</td>
<td>5.09(1.30)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>3.15(1.91)</td>
<td>Mean Difference</td>
<td>1.94(0.65,3.231607)</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program) (P-value&lt;0.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate</td>
<td>Questionnaire (General/undefined)(Functional sensibility (Weinstein Enhanced Sensory Test (WEST)))</td>
<td>19.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>11</td>
<td>2.95(0.65)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>2.58(0.67)</td>
<td>Mean Difference</td>
<td>0.37(-0.16,0.899344)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate</td>
<td>Questionnaire (General/undefined)(Moberg pick-up test)</td>
<td>19.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>11</td>
<td>3.33(0.37)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>3.68(0.49)</td>
<td>Mean Difference</td>
<td>-0.35(-0.69,-0.00538)</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program) (P-value&lt;.05)</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate</td>
<td>Two-point discrimination (2PD)(Functional sensibility (static two point discrimination (2PD)))</td>
<td>17.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>16</td>
<td>5.19(3.24)</td>
<td>No further treatment (No further treatment)</td>
<td>15</td>
<td>6.3(3.38)</td>
<td>Mean Difference</td>
<td>-1.11(-3.44,1.223739)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate Quality</td>
<td>Two-point discrimination (2PD)(Functional sensibility (static two point discrimination (2PD)))</td>
<td>18.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>13</td>
<td>3.42(1.38)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>5.81(2.89)</td>
<td>Mean Difference</td>
<td>-2.39(-4.13,-0.64905)</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program) (P-value&lt;.05)</td>
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<td>Jerosch-Herold,C., 2012</td>
<td>Moderate Quality</td>
<td>Two-point discrimination (2PD)(Functional sensibility (static two point discrimination (2PD)))</td>
<td>19.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>11</td>
<td>4.18(1.74)</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>6.35(4.09)</td>
<td>Mean Difference</td>
<td>-2.17(-4.62,0.279618)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Provinciali, L., 2000</td>
<td>Moderate Quality Questionnaire (General/undefined) (Boston CT score-walking with numbness)</td>
<td>NA</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>3.84(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>3.8(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Provinciali, L., 2000</td>
<td>Moderate Quality Questionnaire (General/undefined) (Boston CT score-walking with numbness)</td>
<td>1 month</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>1(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
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<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
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<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<td>Provinciali, L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Boston CT score-walking with numbness)</td>
<td>3 months</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>1(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Fagan, D.J., 2004</td>
<td>High Quality</td>
<td>Median nerve swelling (Swelling: volume of operated hand)</td>
<td>Peri-Op</td>
<td>Elevation device (Post-op day-case-4 hour Home elevation device+Bradford Sling with high elevation)</td>
<td>21</td>
<td>370 (78.00)</td>
<td>Simple sling (Post-op day-case-4 hour Crepe sling held with low elevation (below 90 degrees))</td>
<td>22</td>
<td>363 (68.00)</td>
<td>Mean Difference</td>
<td>7(-36.82,50.82237)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Fagan, D.J., 2004</td>
<td>High Quality</td>
<td>Median nerve swelling (Swelling: volume of operated hand)</td>
<td>5 Days</td>
<td>Elevation device (Post-op day-case-4 hour Home elevation device+Bradford Sling with high elevation)</td>
<td>21</td>
<td>380 (77.00)</td>
<td>Simple sling (Post-op day-case-4 hour Crepe sling held with low elevation (below 90 degrees))</td>
<td>22</td>
<td>376 (67.00)</td>
<td>Mean Difference</td>
<td>4(-39.23,47.22583)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Jerosch-Herold, C., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (DASH) (DASH addresses symptoms as well as function)</td>
<td>17.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>16</td>
<td>38.94 (22.29)</td>
<td>No further treatment (No further treatment)</td>
<td>15</td>
<td>47 (19.88)</td>
<td>Mean Difference</td>
<td>-8.06 (-22.91,6.789555)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1</td>
<td>Treatment 2 (Details)</td>
<td>Group2</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (DASH) (DASH addresses symptoms as well as function)</td>
<td>18.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>13</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>Mean Difference</td>
<td>-7.58(-23.92,8.762888)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Jerosch-Herold,C., 2012</td>
<td>Moderate Quality</td>
<td>Questionnaire (DASH) (DASH addresses symptoms as well as function)</td>
<td>19.5 months</td>
<td>4-week sensory relearning home program (Post-op 4-week sensory relearning home program)</td>
<td>11</td>
<td>No further treatment (No further treatment)</td>
<td>13</td>
<td>Mean Difference</td>
<td>-12.86(-31.69,5.970518)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Provinciali,L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Boston CT score-duration of episode)</td>
<td>NA</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
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<td>Effect Measure</td>
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<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Boston CT score-duration of episode)</td>
<td>1 month</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>2.04(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>2.02(.)</td>
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<td>3 months</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
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<td>1(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Fagan,D.J., 2004</td>
<td>High Quality</td>
<td>Questionnaire/Scale (VAS-pain)( )</td>
<td>5 Days</td>
<td>Elevation device (Post-op day-case-4 hour Home elevation device+Bradford Sling with high elevation)</td>
<td>21</td>
<td>2.2(1.30)</td>
<td>Simple sling (Post-op day-case-4 hour Crepe sling held with low elevation (below 90 degrees))</td>
<td>22</td>
<td>2.7(1.50)</td>
<td>Mean Difference</td>
<td>-0.5(-1.34,0.337883)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Alves,M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (pain)(Palmar pain)</td>
<td>1 month</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>27.59%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>37.93%</td>
<td>RR</td>
<td>0.73(0.34,1.54)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Duration</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Alves,M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (pain)(Palmar pain)</td>
<td>2 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>RR</td>
<td>0.17(0.02,1.30)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<tr>
<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (pain) (Palmar pain)</td>
<td>3 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>3.45%</td>
<td>RD</td>
<td>-0.03 (-0.10, 0.03)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<td>Reference Title</td>
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<tr>
<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (pain) (Palmar pain)</td>
<td>5.9 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>3.45%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>3.45%</td>
<td>RR</td>
<td>1.00(0.07,15.24)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Reference Title</td>
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<td>Outcome Details</td>
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<td>Provinciali,L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Boston CT score-daytime pain)</td>
<td>NA</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>2.66(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>2.72(.)</td>
<td>Author Reported</td>
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<td>Questionnaire (General/undefined)(Boston CT score-recurrence of pain)</td>
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<td>50</td>
<td>2.82(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
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<td>2.9(.)</td>
<td>Author Reported</td>
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<td>Provinciali,L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Boston CT score-severity of pain)</td>
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<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Provinciali, L., 2000</td>
<td>Moderate Qualityuestionnaire (General/undefined) (Boston CT score-daytime pain)</td>
<td>1 month</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1.64(.)</td>
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<td>1.5(.)</td>
<td>Author Reported</td>
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<td>50</td>
<td>1.78(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>1.62(.)</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Moderate Quality</td>
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<td>1 month</td>
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<td>1.12(0)</td>
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<td>1.18(0)</td>
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<td>NA</td>
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<td>Provinciali,L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Boston CT score-waking with pain)</td>
<td>1 month</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1.1(0)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>1.08(0)</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Provinciali,L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Boston CT score-daytime pain)</td>
<td>3 months</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>1(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Boston CT score-recurrence of pain)</td>
<td>3 months</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>1(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>1(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Provinciali,L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Boston CT score-waking with pain)</td>
<td>3 months</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1(.)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>1(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
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<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Pomerance J., 2007</td>
<td>High Quality</td>
<td>Return to Work (after each interval, same number of patients included from previous interval (# is # not returning to work))</td>
<td>NR</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>30.14%</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>27.27%</td>
<td>RR</td>
<td>1.11(0.67,1.83)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>High Quality</td>
<td>Return to Work (after each interval, same number of patients included from previous interval (# is # not returning to work))</td>
<td>1.4 months</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>15.07%</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>16.88%</td>
<td>RR</td>
<td>0.89(0.43,1.86)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Result (95% CI)</td>
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<tr>
<td>Pomerance J., 2007</td>
<td>High Quality</td>
<td>Return to Work (after each interval, same number of patients included from previous interval (# is # not returning to work))</td>
<td>1.8 months</td>
<td>Home therapy exercises (Post-op 2 week therapist-directed program)</td>
<td>73</td>
<td>2.74%</td>
<td>No therapy (No therapist-directed program (received instructions))</td>
<td>77</td>
<td>6.49%</td>
<td>RR</td>
<td>0.42 (0.08, 2.11)</td>
<td>Not Significant (P-value &gt; .05)</td>
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### TABLE 203: PICO 14- POST-OP THERAPY: SYMPTOMS

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group 1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group 2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general) (Nighttime pain)</td>
<td>1 month</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Outcome Details</td>
<td>Duration</td>
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<tr>
<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general)(Nighttime pain)</td>
<td>2 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Mean2/P 2 (SD2)</td>
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<td>Result (95% CI)</td>
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<td>Alves,M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general)(Nighttime pain)</td>
<td>3 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;0.05)</td>
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<td>Reference Title</td>
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<td>Treatment 1 (Details)</td>
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<td>Mean1/P 1 (SD1)</td>
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<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (general)(Nighttime pain)</td>
<td>5.9 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>RD</td>
<td>0.00(0.00,0.00)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
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<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (numbness) (May not completely be a recurrence for all patients)</td>
<td>1 month</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29 10.34%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29 27.59%</td>
<td>RR</td>
<td>0.38 (0.11, 1.27)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Alves, M.P.T., 2011</td>
<td>Moderately Quality</td>
<td>Symptom recurrence (numbness)(May not completely be a recurrence for all patients)</td>
<td>2 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>20.69%</td>
<td>RD</td>
<td>-0.21(-0.35,-0.06)</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).) Significant (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
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<td>Outcome Details</td>
<td>Duration</td>
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<td>Group 1 N</td>
<td>Treatment 2 (Details)</td>
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<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Alves,M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (numbness)(May not completely be a recurrence for all patients)</td>
<td>3 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%激光治疗 (治疗在10天的连续会话中进行，其间有两天的间隔(周末)，使用总共有三焦耳的能量，在腕管的解剖位置（在舟状骨、腕管的中间和腕管的远端）的三个点。)</td>
<td>29</td>
<td>10.34%</td>
<td>RD</td>
<td>-0.10(-0.21,0.01)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Duration</td>
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<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
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<tr>
<td>Alves, M.P.T., 2011</td>
<td>Moderate Quality</td>
<td>Symptom recurrence (numbness)(May not completely be a recurrence for all patients)</td>
<td>5.9 months</td>
<td>Low-level laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>0.00%</td>
<td>Placebo laser therapy (The treatment was performed in 10 daily, consecutive sessions, with an interval of two days (weekend), using a total of three Joules, at three points of the carpal tunnel (in the topography of the pisiform bone, in the middle of the carpal tunnel and at the distal limit of the carpal tunnel).)</td>
<td>29</td>
<td>6.90%</td>
<td>RD</td>
<td>-0.07 (-0.16, 0.02)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Provinciali, L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Boston CT score-numbness)</td>
<td>NA</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>3.02(,)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>2.78(,)</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Questionnaire (General/undefined) (Boston CT score-severity of numbness)</td>
<td>NA</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>3.68(,)</td>
<td>Progressive home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>3.62(,)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Duration</td>
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<td>Effect Measure</td>
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<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Boston CT score-tingling sensation)</td>
<td>NA</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>3.5(.)</td>
<td>Progressively home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>3.38(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<td>Provinciali,L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Boston CT score-weakness)</td>
<td>NA</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>3.96(.)</td>
<td>Progressively home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
<td>50</td>
<td>3.9(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Provinciali, L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Boston CT score-numbness)</td>
<td>1 month</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1.02(,)</td>
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<tr>
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<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Boston CT score-severity of numbness)</td>
<td>1 month</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
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<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure (95% CI)</td>
<td>Result</td>
<td>Favored Treatment</td>
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<td>Duration</td>
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<td>Mean1/P 1 (SD1)</td>
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<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>1(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>1(.)</td>
<td>Author Reported</td>
<td>Not Significant (P-value&gt;.05)</td>
<td></td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
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<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
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<td>Favored Treatment</td>
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<tr>
<td>Provinciali, L., 2000</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(Boston CT score-tingling sensation)</td>
<td>3 months</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1(+)</td>
<td>Progressiv e home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
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<td>Provinciali, L., 2000</td>
<td>Moderate Quality</td>
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<td>3 months</td>
<td>Rehabilitation program (Post-op 10 day 1-hour sessions of physiotherapy 12 days after surgery (multimodal rehabilitative treatment))</td>
<td>50</td>
<td>1(+)</td>
<td>Progressiv e home exercise program (Post-op non-splinting progressive home exercise program designed to gradually increase strength and endurance)</td>
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<td>1(+)</td>
<td>Author Reported</td>
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</table>
POSTOPERATIVE IMMOBILIZATION

Strong evidence supports no benefit to routine postoperative immobilization after carpal tunnel release.

Strength of Recommendation: Strong Evidence ★★★★★

Description: Evidence from two or more “High” quality studies with consistent findings for recommending for or against the intervention.

Rationale

There were two high quality studies (Bury et al, Finsen et al) and four moderate quality studies (Cebesay et al, Cook et al, Huemer et al, Martins et al) that evaluated post-operative splinting in comparison to no splinting. These studies did not identify any clear benefit to immediate post-operative splinting.

One high quality study (Bury et al) showed no short or long-term difference in regards to grip strength, pinch strength, and range of motion between patients splinted for 2 weeks post-operatively and patients who had no splinting. A second high quality study (Finsen et al) also showed no difference in grip strength and pinch at 1.4 and 5.9 months between the splinted and unsplinted groups.

A moderate strength study (Cook et al) did show a statistically significant improvement in grip and pinch strength at 2 weeks and 4 weeks in patients who were not splinted and allowed to begin early range of motion exercises compared with patients splinted for 2 weeks. A treatment effect of allowing early range of motion exercises may have contributed to the increase in the improvement in motion in the short term. At three months after surgery, there was no difference between the splinted and unsplinted groups in regards to grip and pinch strength.

One moderate strength study (Martins et al) did show a short-term benefit to post-operative splinting in regards to 2-point discrimination at 2 weeks in patients that were splinted, but this effect was not present at the 3 month follow-up.

One high quality study (Ritting et al) showed no difference in wound complications between patients who removed a bulky, post-operative dressing at 48-72 hours and patients who kept their dressing on for 2 weeks. At two weeks follow-up, the group who removed their dressing early had better grip and 3-point pinch strength, however, there was no difference in 3-point pinch strength between the groups at week follow up six and 12 weeks after surgery. Of note, the patients randomized to early dressing removal had better grip strength pre-operatively, compared to the group randomized to maintaining the dressing for 2 weeks, which may have accounted for the differences observed.

Risks and Harms of Implementing This Recommendation

There are no known harms associated with implementing this recommendation.

Future Research

Future research should focus on determining if there is a benefit to beginning early range of motion exercises and when a patient may return to unrestricted activities.
## STUDY QUALITY TABLE OF POST-OPERATIVE IMMOBILIZATION

### TABLE 204. INTERVENTION QUALITY EVALUATIONS

<table>
<thead>
<tr>
<th>Study</th>
<th>Random Sequence Generation</th>
<th>Allocation Concealment</th>
<th>Blinding</th>
<th>Incomplete Outcome Data</th>
<th>Selective Reporting</th>
<th>Other Bias</th>
<th>Is there a large magnitude of effect?</th>
<th>Influence of All Plausible Residual Confounding</th>
<th>Dose-Response Gradient</th>
<th>Inclusion</th>
<th>Strength</th>
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<tbody>
<tr>
<td>Bury, T.F., 1995</td>
<td><img src="image" alt="●" /></td>
<td><img src="image" alt="○" /></td>
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<tr>
<td>Cebesoy, O., 2007</td>
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<td><img src="image" alt="○" /></td>
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<td>Finsen, V., 1999</td>
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<td>High Quality</td>
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RESULTS

SUMMARY OF DATA FINDINGS

TABLE 205: SUMMARY OF FINDINGS PICO 15 POST-OP IMMOBILIZATION (EARLY FOLLOW-UP (< 1 MONTH))

<table>
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<th></th>
<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
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<tr>
<td>Favors treatment 1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Favors treatment 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not significant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complications</td>
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<tr>
<td>Symptom occurrence (pillar pain)</td>
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<tr>
<td>Symptom occurrence (scar tenderness)</td>
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<tr>
<td>Function</td>
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<td>Durkan’s results</td>
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<td></td>
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<tr>
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<td>Pinch Strength (three-point pinch)</td>
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<tr>
<td>0 days</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>14 days</td>
<td></td>
<td></td>
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<td>Questionnaire (General/Undefinded)</td>
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<td>DI, discrimination index (equivalent to pre-op - post-op 2PD)</td>
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<td>Functional Status Scale</td>
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<td>ROM-degrees (flexion)</td>
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<td>ROM-degrees (supination)</td>
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<td>Two-point discrimination</td>
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<td>Levine-Katz score-Mean difference between both groups</td>
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<td>Pain</td>
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<td>Subjective pain (10 point scale)</td>
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<td>Quality Of Life</td>
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<td>Return to normal activities</td>
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<td>Questionnaire (General/Undefinded)</td>
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<td>SSI, symptom severity index (equivalent to pre-op - post-op SSS)</td>
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<td>Symptom intensity index (equivalent to preop - postop SIS)</td>
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<td>Questionnaire (Levine-SSS)</td>
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0 days = data not available
TABLE 206: SUMMARY OF FINDINGS PICO 15 POST-OP IMMOBILIZATION (LATE FOLLOW-UP (> 1 MONTH))

<table>
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<th>High Quality</th>
<th>Moderate Quality</th>
<th>Meta-Analysis</th>
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<tr>
<td>Favors treatment 1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Favors treatment 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not significant</td>
<td></td>
<td></td>
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</tbody>
</table>

Outcomes

**Complications**

- Questionnaire (General/Undefined)
  - Subjective patient score
  - Symptom occurrence (scar pain)
- NA

**Function**

- Grip Strength
- NA
- Lifting
- NA
- NCS (DML)
- NA
- Pinch Strength
- NA
- Pinch Strength (three-point pinch)
- NA
- Questionnaire (General/Undefined)
  - Functional Status Scale
  - NA

**Range of motion**

- ROM-degrees (extension)
- NA
- ROM-degrees (flexion)
- NA
- ROM-degrees (supination)
- NA
- Two-point discrimination
- NA

**Other**

- Questionnaire (General/Undefined)
  - Levine-Katz score-Mean difference between both groups
  - NA

**Pain**

- Hypothenar pain
  - NA
- Questionnaire (General/Undefined)
  - Subjective pain (10 point scale)
  - NA
- Questionnaire/Scale (VAS-pain)
- NA
- Thenar Atrophy
  - NA

**Symptoms**

- Questionnaire (General/Undefined)
- Symptom severity scale
  - NA
**DETAILED DATA FINDINGS**

**TABLE 207: PICO 15 PART 1- POST-OP IMMOBILIZATION: COMPLICATIONS**

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
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<tbody>
<tr>
<td>Bury,T.F., 1995</td>
<td>High</td>
<td>Questionnaire (General/undefined)(subjective patient score)</td>
<td>5.9 months</td>
<td>Splint (Bulky dressing and splint in a 0-degree or neutral wrist position for 2 weeks)</td>
<td>26</td>
<td>8.1(+)</td>
<td>17</td>
<td>8(+)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Finsen,V., 1999</td>
<td>High</td>
<td>Symptom occurrence (scar pain)(Scar discomfort/pain)</td>
<td>1.4 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>36</td>
<td>44.44%</td>
<td>45</td>
<td>46.67%</td>
<td>RR</td>
<td>0.95(0.59,1.54)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Finsen,V., 1999</td>
<td>High Quality</td>
<td>Symptom occurrence (scar pain)/Scar discomfort/pain</td>
<td>5.9 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>Bulky bandage (Bulky dressing removed at day 2 and light dressings for 4 weeks)</td>
<td>RR</td>
<td>1.19(0.42,3.38)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Cook,A.C., 1995</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (pillar pain)/( )</td>
<td>1 month</td>
<td>Splint (Splint for 2 weeks)</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>RR</td>
<td>2.40(0.99,5.81)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Cook,A.C., 1995</td>
<td>Moderate Quality</td>
<td>Symptom occurrence (scar tenderness)/( )</td>
<td>1 month</td>
<td>Splint (Splint for 2 weeks)</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>RR</td>
<td>1.75(0.90,3.42)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<tr>
<td>Bury,T.F., 1995</td>
<td>High Quality</td>
<td>Grip strength(Kilograms)</td>
<td>5.9 months</td>
<td>Splint (Bulky dressing and splint in a 0-degree or neutral wrist position for 2 weeks)</td>
<td>Bulky dress (Bulky dressing for 2 weeks)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Bury,T.F., 1995</td>
<td>High Quality</td>
<td>Pinch Strength(Kilograms)</td>
<td>5.9 months</td>
<td>Splint (Bulky dressing and splint in a 0-degree or neutral wrist position for 2 weeks)</td>
<td>Bulky dress (Bulky dressing for 2 weeks)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Bury,T.F., 1995</td>
<td>High Quality</td>
<td>Range of motion(Average wrist range of motion in flexionextension (degrees))</td>
<td>Post-Op</td>
<td>Splint (Bulky dressing and splint in a 0-degree or neutral wrist position for 2 weeks)</td>
<td>Bulky dress (Bulky dressing for 2 weeks)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Finsen,V., 1999</td>
<td>High Quality</td>
<td>Grip strength(Units not reported)</td>
<td>1.4 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>Bulky bandage (Bulky dressing removed at day 2 and light dressings for 4 weeks)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Finsen,V., 1999</td>
<td>High Quality</td>
<td>Grip strength(Units not reported)</td>
<td>5.9 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>Bulky bandage (Bulky dressing removed at day 2 and light dressings for 4 weeks)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<td>Finsen,V., 1999</td>
<td>High Quality</td>
<td>Pinch strength (Key pinch strength (units not reported))</td>
<td>1.4 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>36</td>
<td>. %</td>
<td>Bulky bandage (Bulky dressing removed at day 2 and light dressings for 4 weeks)</td>
<td>45</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
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<tr>
<td>Finsen,V., 1999</td>
<td>High Quality</td>
<td>Pinch strength (Key pinch strength (units not reported))</td>
<td>5.9 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>37</td>
<td>. %</td>
<td>Bulky bandage (Bulky dressing removed at day 2 and light dressings for 4 weeks)</td>
<td>44</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
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<tr>
<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>Peri-Op</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>45</td>
<td>22.3(11.60)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>16.6(6.80)</td>
<td>Mean Difference</td>
<td>5.7(1.81,9.587473)</td>
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<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Grip strength (Kilograms)</td>
<td>2 weeks</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>45</td>
<td>13.9(9.90)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>10.3(7.90)</td>
<td>Mean Difference</td>
<td>3.6(-0.04,7.241421)</td>
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<td>Quality</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Grip strength(Kilograms)</td>
<td>2.8 months</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>Mean Difference</td>
<td>16(10.43,21.57387)</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (P-value&lt;.05)</td>
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<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Pinch Strength (three-point pinch)(Units not reported)</td>
<td>Peri-Op</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>Mean Difference</td>
<td>0.8(-0.28,1.879879)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Pinch Strength (three-point pinch)(Units not reported)</td>
<td>2 weeks</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>Mean Difference</td>
<td>10(0.19,1.812096)</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (P-value&lt;.05)</td>
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<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Pinch Strength (three-point pinch)(Units not reported)</td>
<td>2.8 months</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>Mean Difference</td>
<td>1.1(-0.08,2.278628)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<td>Reference Title</td>
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<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Range of motion (RoM-degrees (extension))</td>
<td>Peri-Op</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip</td>
<td>45</td>
<td>70(10.00)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>61(11.00)</td>
<td>Mean Difference</td>
<td>9(4.75,13.24538)</td>
</tr>
<tr>
<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Range of motion (RoM-degrees (flexion))</td>
<td>Peri-Op</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip</td>
<td>45</td>
<td>59(12.00)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>60(13.00)</td>
<td>Mean Difference</td>
<td>-1(-6.05,4.053980)</td>
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<tr>
<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Range of motion (RoM-degrees (supination))</td>
<td>Peri-Op</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip</td>
<td>45</td>
<td>74(11.00)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>74(8.00)</td>
<td>Mean Difference</td>
<td>0(-3.92,3.917554)</td>
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<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Range of motion (RoM-degrees (extension))</td>
<td>2 weeks</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip</td>
<td>45</td>
<td>65(10.00)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>61(10.00)</td>
<td>Mean Difference</td>
<td>4(-0.05,8.046836)</td>
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<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Range of motion(RoM-degrees (flexion))</td>
<td>2 weeks</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>45</td>
<td>55(11.00)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>56(14.00)</td>
<td>Mean Difference</td>
<td>-1(-6.07,4.069125)</td>
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<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Range of motion(RoM-degrees (supination))</td>
<td>2 weeks</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>45</td>
<td>72(9.00)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>75(9.00)</td>
<td>Mean Difference</td>
<td>-3(-6.64,0.642153)</td>
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<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Range of motion(RoM-degrees (extension))</td>
<td>2.8 months</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>30</td>
<td>66(10.00)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>36</td>
<td>65(8.00)</td>
<td>Mean Difference</td>
<td>1(-3.43,5.431122)</td>
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<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Range of motion(RoM-degrees (flexion))</td>
<td>2.8 months</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>30</td>
<td>60(12.00)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>36</td>
<td>62(13.00)</td>
<td>Mean Difference</td>
<td>-2(-8.04,4.039359)</td>
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<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Treatment 2 (Details)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Ritting,A.W., 2012</td>
<td>High Quality</td>
<td>Range of motion(RoM-degrees (supination))</td>
<td>2.8 months</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>Mean Difference</td>
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<td>Not Significant (P-value&gt;.05)</td>
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<td>Cebesoy,O., 2007</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (functional status scale.)</td>
<td>1 month</td>
<td>Splint (Splint at day 10 followed by exercises at 3 weeks)</td>
<td>Bulky dressing (Immediate exercise followed by bulky bandage at day 10)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Cebesoy,O., 2007</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (functional status scale.)</td>
<td>3 months</td>
<td>Splint (Splint at day 10 followed by exercises at 3 weeks)</td>
<td>Bulky dressing (Immediate exercise followed by bulky bandage at day 10)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Cook,A.C., 1995</td>
<td>Moderate Quality</td>
<td>Grip strength(Kilograms)</td>
<td>2 weeks</td>
<td>Splint (Splint for 2 weeks)</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>Author Reported</td>
<td>NA</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks) (P-value&lt;.05)</td>
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<td>Cook,A.C., 1995</td>
<td>Moderate Quality</td>
<td>Grip strength(Kilograms)</td>
<td>1 month</td>
<td>Splint (Splint for 2 weeks)</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>Author Reported</td>
<td>NA</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks) (P-value&lt;.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Group1 Mean/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Group2 Mean/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<tr>
<td>Cook, A.C., 1995</td>
<td>Moderate Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>2 weeks</td>
<td>Splint (Splint for 2 weeks)</td>
<td>25</td>
<td>4(,)</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>25</td>
<td>6(,)</td>
<td>Author Reported</td>
<td>NA</td>
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<tr>
<td>Cook, A.C., 1995</td>
<td>Moderate Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>1 month</td>
<td>Splint (Splint for 2 weeks)</td>
<td>25</td>
<td>5(,)</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>25</td>
<td>7(,)</td>
<td>Author Reported</td>
<td>NA</td>
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<tr>
<td>Cook, A.C., 1995</td>
<td>Moderate Quality</td>
<td>Pinch Strength (Kilograms)</td>
<td>3 months</td>
<td>Splint (Splint for 2 weeks)</td>
<td>25</td>
<td>. %</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>25</td>
<td>. %</td>
<td>Author Reported</td>
<td>NA</td>
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<td>Huemer, G.M., 2007</td>
<td>Moderate Quality</td>
<td>Grip strength (Kilograms)</td>
<td>3 months</td>
<td>Splinted (Bulky dressing with volar splint for 2 days)</td>
<td>25</td>
<td>44(,)</td>
<td>Non-splinted (Light bandage for 2 days)</td>
<td>25</td>
<td>40(,)</td>
<td>Author Reported</td>
<td>NA</td>
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<tr>
<td>Huemer, G.M., 2007</td>
<td>Moderate Quality</td>
<td>Lifting (Pick-up test (mean))</td>
<td>3 months</td>
<td>Splinted (Bulky dressing with volar splint for 2 days)</td>
<td>25</td>
<td>19(,)</td>
<td>Non-splinted (Light bandage for 2 days)</td>
<td>25</td>
<td>17(,)</td>
<td>Author Reported</td>
<td>NA</td>
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<tr>
<td>Huemer, G.M., 2007</td>
<td>Moderate Quality</td>
<td>NCS (DML) (Distal motor latency (ms) (improvement))</td>
<td>3 months</td>
<td>Splinted (Bulky dressing with volar splint for 2 days)</td>
<td>25</td>
<td>2.47(,)</td>
<td>Non-splinted (Light bandage for 2 days)</td>
<td>25</td>
<td>2.48(,)</td>
<td>Author Reported</td>
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<tr>
<td>Huemer, G.M., 2007</td>
<td>Moderate Quality</td>
<td>Two-point discrimination (Millimeters)</td>
<td>3 months</td>
<td>Splinted (Bulky dressing with volar splint for 2 days)</td>
<td>25</td>
<td>6(,)</td>
<td>Non-splinted (Light bandage for 2 days)</td>
<td>25</td>
<td>6(,)</td>
<td>Author Reported</td>
<td>NA</td>
</tr>
<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
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<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
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<td>Martins,R.S., 2006</td>
<td>Moderate Quality</td>
<td>Durkan’s results(+durken’s test)</td>
<td>2 weeks</td>
<td>Splint (Neutral-position wrist splint continuously for two weeks)</td>
<td>26</td>
<td>96.15%</td>
<td>No splint (No wrist immobilization)</td>
<td>26</td>
<td>100.00%</td>
<td>RR</td>
<td>(...)</td>
</tr>
<tr>
<td>Martins,R.S., 2006</td>
<td>Moderate Quality</td>
<td>Phalen’s test score(# positive)</td>
<td>2 weeks</td>
<td>Splint (Neutral-position wrist splint continuously for two weeks)</td>
<td>26</td>
<td>92.31%</td>
<td>No splint (No wrist immobilization)</td>
<td>26</td>
<td>96.15%</td>
<td>RR</td>
<td>0.96(0.84,1.10)</td>
</tr>
<tr>
<td>Martins,R.S., 2006</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(DI, discrimination index (equivalent to pre-op - post-op 2PD))</td>
<td>2 weeks</td>
<td>Splint (Neutral-position wrist splint continuously for two weeks)</td>
<td>26</td>
<td>0.27(0.27)</td>
<td>No splint (No wrist immobilization)</td>
<td>26</td>
<td>0.29(0.28)</td>
<td>Mean Difference</td>
<td>-0.02(-0.17,0.129516)</td>
</tr>
<tr>
<td>Martins,R.S., 2006</td>
<td>Moderate Quality</td>
<td>Tinel’s Sign/Test(# positive)</td>
<td>2 weeks</td>
<td>Splint (Neutral-position wrist splint continuously for two weeks)</td>
<td>26</td>
<td>80.77%</td>
<td>No splint (No wrist immobilization)</td>
<td>26</td>
<td>88.46%</td>
<td>RR</td>
<td>0.91(0.72,1.15)</td>
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<tr>
<td>Martins,R.S., 2006</td>
<td>Moderate Quality</td>
<td>Two-point discrimination(Millimeters)</td>
<td>2 weeks</td>
<td>Splint (Neutral-position wrist splint continuously for two weeks)</td>
<td>26</td>
<td>3.69(1.19)</td>
<td>No splint (No wrist immobilization)</td>
<td>26</td>
<td>5.12(2.53)</td>
<td>Mean Difference</td>
<td>-1.43(-2.50,-0.35529)</td>
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### TABLE 209: PICO 15 PART 1 - POST-OP IMMOBILIZATION: OTHER

<table>
<thead>
<tr>
<th>Reference Title</th>
<th>Quality</th>
<th>Outcome Details</th>
<th>Duration</th>
<th>Treatment 1 (Details)</th>
<th>Group1 N</th>
<th>Mean1/P1 (SD1)</th>
<th>Treatment 2 (Details)</th>
<th>Group2 N</th>
<th>Mean2/P2 (SD2)</th>
<th>Effect Measure</th>
<th>Result (95% CI)</th>
<th>Favored Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ritting, A.W., 2012</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (Levine-Katz score-Mean difference between both groups)</td>
<td>Peri-Op</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>45</td>
<td>34 (34.23)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>38 (28.57)</td>
<td>Mean Difference</td>
<td>-4 (-10.22, 8.81)</td>
<td>Not Significant (P-value &gt;.05)</td>
</tr>
<tr>
<td>Ritting, A.W., 2012</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (Levine-Katz score-Mean difference between both groups)</td>
<td>2 weeks</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>45</td>
<td>19 (20.54)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>49</td>
<td>20 (25.00)</td>
<td>Mean Difference</td>
<td>-1 (-10.22, 8.22)</td>
<td>Not Significant (P-value &gt;.05)</td>
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<td>Reference Title</td>
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<td>Mean1/P1 (SD1)</td>
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<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Ritting, A.W., 2012</td>
<td>High Quality</td>
<td>Questionnaire (General/undefined) (Levine-Katz score - Mean difference between both groups)</td>
<td>2.8 months</td>
<td>Bulky dressing removed at 48-72 hours with placement of an adhesive strip (Bulky dressing removed at 48-72 hours with placement of an adhesive strip)</td>
<td>30</td>
<td>16 (13.97)</td>
<td>Bulky dressing removed at 2 weeks (Bulky dressing removed at 2 weeks)</td>
<td>36</td>
<td>17 (18.37)</td>
<td>Mean Difference</td>
<td>-1 (-8.81, 6.81)</td>
<td>Not Significant (P-value &gt; 0.05)</td>
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<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Finsen, V., 1999</td>
<td>High Quality</td>
<td>Hypothenar pain( )</td>
<td>1.4 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>36</td>
<td>13.89%</td>
<td>Bulky bandage (Bulky dressing removed at day 2 and light dressings for 4 weeks)</td>
<td>45</td>
<td>11.11%</td>
<td>RR</td>
<td>1.25(0.39,3.99)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Finsen, V., 1999</td>
<td>High Quality</td>
<td>Hypothenar pain( )</td>
<td>5.9 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>37</td>
<td>8.11%</td>
<td>Bulky bandage (Bulky dressing removed at day 2 and light dressings for 4 weeks)</td>
<td>44</td>
<td>2.27%</td>
<td>RR</td>
<td>3.57(0.39,32.87)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Finsen, V., 1999</td>
<td>High Quality</td>
<td>Thenar Atrophy (Thenar pain)</td>
<td>1.4 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>36</td>
<td>5.56%</td>
<td>Bulky bandage (Bulky dressing removed at day 2 and light dressings for 4 weeks)</td>
<td>45</td>
<td>2.22%</td>
<td>RR</td>
<td>2.50 (0.24, 26.48)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Finsen, V., 1999</td>
<td>High Quality</td>
<td>Thenar Atrophy (Thenar pain)</td>
<td>5.9 months</td>
<td>Splint (Bulky dressing removed at day 2 and well-padded plaster of Paris splint with the wrist in slight dorsiflexion for 4 weeks)</td>
<td>37</td>
<td>2.70%</td>
<td>Bulky bandage (Bulky dressing removed at day 2 and light dressings for 4 weeks)</td>
<td>44</td>
<td>2.27%</td>
<td>RR</td>
<td>1.19 (0.08, 18.36)</td>
<td>Not Significant (P-value &gt; .05)</td>
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<tr>
<td>Reference Title</td>
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<td>Duration</td>
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<td>Group 1 N</td>
<td>Mean1/P 1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group 2 N</td>
<td>Mean2/P 2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Cook,A.C., 1995</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Subjective pain (10 point scale))</td>
<td>2 weeks</td>
<td>Splint (Splint for 2 weeks)</td>
<td>25</td>
<td>2.4(.)</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>25</td>
<td>0.9(.)</td>
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<td>Cook,A.C., 1995</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Subjective pain (10 point scale))</td>
<td>1 month</td>
<td>Splint (Splint for 2 weeks)</td>
<td>25</td>
<td>1.5(.)</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>25</td>
<td>0.5(.)</td>
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<td>NA</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks) (P-value&lt;.05)</td>
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<td>Cook,A.C., 1995</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Subjective pain (10 point scale))</td>
<td>5.9 months</td>
<td>Splint (Splint for 2 weeks)</td>
<td>25</td>
<td>.%</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>25</td>
<td>.%</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Huemer,G.M. , 2007</td>
<td>Moderate Quality</td>
<td>Questionnaire/Scale (VAS-pain)</td>
<td>3 months</td>
<td>Splinted (Bulky dressing with volar splint for 2 days)</td>
<td>25</td>
<td>1(.)</td>
<td>Non-splinted (Light bandage for 2 days)</td>
<td>25</td>
<td>1(.)</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group 1</td>
<td>Treatment 2 (Details)</td>
<td>Group 2</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<td>Cook, A.C., 1995</td>
<td>Moderate Quality</td>
<td>Return to Normal Activities( )</td>
<td>Post-Op</td>
<td>Splint (Splint for 2 weeks)</td>
<td>25</td>
<td>12( )</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>25</td>
<td>Author Reported</td>
<td>NA</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks) (P-value&lt;.05)</td>
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<td>Cook, A.C., 1995</td>
<td>Moderate Quality</td>
<td>Return to Work(Full duty work)</td>
<td>Post-Op</td>
<td>Splint (Splint for 2 weeks)</td>
<td>25</td>
<td>27( )</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks)</td>
<td>25</td>
<td>Author Reported</td>
<td>NA</td>
<td>No splint (exercises) (Range-of-motion exercises for 2 weeks) (P-value&lt;.05)</td>
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<tr>
<td>Reference Title</td>
<td>Quality</td>
<td>Outcome Details</td>
<td>Duration</td>
<td>Treatment 1 (Details)</td>
<td>Group1 N</td>
<td>Mean1/P1 (SD1)</td>
<td>Treatment 2 (Details)</td>
<td>Group2 N</td>
<td>Mean2/P2 (SD2)</td>
<td>Effect Measure</td>
<td>Result (95% CI)</td>
<td>Favored Treatment</td>
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<tr>
<td>Cebesoy,O., 2007</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(symptom severity scale)</td>
<td>1 month</td>
<td>Splint (Splint at day 10 followed by exercises at 3 weeks)</td>
<td>20</td>
<td>16.5()</td>
<td>Bulky dressing (Immediate exercise followed by bulky bandage at day 10)</td>
<td>20</td>
<td>16.84()</td>
<td>Author Reported</td>
<td>NA</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Cebesoy,O., 2007</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(symptom severity scale)</td>
<td>3 months</td>
<td>Splint (Splint at day 10 followed by exercises at 3 weeks)</td>
<td>20</td>
<td>13.5()</td>
<td>Bulky dressing (Immediate exercise followed by bulky bandage at day 10)</td>
<td>20</td>
<td>11.9()</td>
<td>Author Reported</td>
<td>NA</td>
<td>Bulky dressing (Immediate exercise followed by bulky bandage at day 10) (P-value&lt;.05)</td>
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<tr>
<td>Martins,R.S., 2006</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(SSI, symptom severity index (equivalent to pre-op - post-op SSS))</td>
<td>2 weeks</td>
<td>Splint (Neutral-position wrist splint continuously for two weeks)</td>
<td>26</td>
<td>0.64(0.15)</td>
<td>No splint (No wrist immobilization)</td>
<td>26</td>
<td>0.61(0.12)</td>
<td>Mean Difference</td>
<td>0.03(-0.04,0.103838)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
<tr>
<td>Martins,R.S., 2006</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined)(symptom intensity index (equivalent to preop - postop SIS))</td>
<td>2 weeks</td>
<td>Splint (Neutral-position wrist splint continuously for two weeks)</td>
<td>26</td>
<td>0.91(0.15)</td>
<td>No splint (No wrist immobilization)</td>
<td>26</td>
<td>0.8(0.27)</td>
<td>Mean Difference</td>
<td>0.11(-0.01,0.228725)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Martins,R.S., 2006</td>
<td>Moderate Quality</td>
<td>Questionnaire (General/undefined) (Symptom Intensity Scale - SIS.)</td>
<td>2 weeks</td>
<td>Splint (Neutral-position wrist splint continuously for two weeks)</td>
<td>26</td>
<td>0.77(1.31)</td>
<td>No splint (No wrist immobilization)</td>
<td>26</td>
<td>1.54(1.96)</td>
<td>Mean Difference</td>
<td>-0.77(-1.68,0.136185)</td>
<td>Not Significant (P-value&gt;.05)</td>
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<tr>
<td>Martins,R.S., 2006</td>
<td>Moderate Quality</td>
<td>Questionnaire (Levine-SSS)(Symptom Severity Score)</td>
<td>2 weeks</td>
<td>Splint (Neutral-position wrist splint continuously for two weeks)</td>
<td>26</td>
<td>11.38(4.57)</td>
<td>No splint (No wrist immobilization)</td>
<td>26</td>
<td>12.33(4.77)</td>
<td>Mean Difference</td>
<td>-0.95(-3.49,1.589222)</td>
<td>Not Significant (P-value&gt;.05)</td>
</tr>
</tbody>
</table>
VII. APPENDIXES
APPENDIX I
WORK GROUP ROSTER

Brent Graham, MD, MSc, FRCSC, Chair
Representing Society(ies):
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The Hand & Upper Extremity Center of Georgia, P.C.
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Mickey S. Cho, MD
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NorthShore Medical Group
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APPENDIX II

AAOS BODIES THAT APPROVED THIS CLINICAL PRACTICE GUIDELINE

Committee on Evidence Based Quality and Value

The committee on Evidence Based Quality and Value (EBQV) consists of twenty AAOS members who implement evidence-based quality initiatives such as clinical practice guidelines (CPGs) and appropriate use criteria (AUCs). They also oversee the dissemination of related educational materials and promote the utilization of orthopaedic value products by the Academy’s leadership and its members.

Council on Research and Quality

The Council on Research and Quality promotes ethically and scientifically sound clinical and translational research to sustain patient care in musculoskeletal disorders. The Council also serves as the primary resource for educating its members, the public, and public policy makers regarding evidenced-based medical practice, orthopaedic devices and biologics, regulatory pathways and standards development, patient safety, occupational health, technology assessment, and other related important errors.

The Council is comprised of the chairs of the committees on Biological Implants, Biomedical Engineering, Occupational Health and Workers’ Compensation, Patient Safety, Research Development, U.S. Bone and Joint Decade, and chair and Appropriate Use Criteria and Clinical Practice Guideline section leaders of the Evidence Based Quality and Value committee. Also on the Council are the second vice-president, three members at large, and representatives of the Diversity Advisory Board, Women's Health Issues Advisory Board, Board of Specialty Societies (BOS), Board of Councilors (BOC), Communications Cabinet, Orthopaedic Research Society (ORS), Orthopedic Research and Education Foundation (OREF).

Board of Directors

The 17 member Board of Directors manage the affairs of the AAOS, set policy, and oversee the Strategic Plan.
APPENDIX III
A Priori Pico Questions and Additional Details Regarding Pico Questions

1. For patients with symptoms consistent with CTS (median nerve involvement at the level of the wrist) what physical examination maneuvers lead to an accurate diagnosis of CTS?

   - Additional Information regarding this PICO question and the resulting recommendation: One member of the guideline development group chose not to approve the rationale that accompanied recommendation 1C: Maneuvers.

2. For patients with symptoms consistent with CTS (median nerve involvement at the level of the wrist) what topics should be addressed in the history interview lead to an accurate diagnosis of CTS?

3. For patients with symptoms consistent with CTS (median nerve involvement at the level of the wrist) are imaging modalities necessary to aid the diagnosis, management, and prognosis of CTS?

4. For patients with symptoms consistent with CTS (median nerve involvement at the level of the wrist) are diagnostic scales necessary to aid the diagnosis, management, and prognosis of CTS?

   - Additional Information regarding PICO question or resulting recommendation: One member of the guideline development group chose not to approve the guideline recommendation and the rationale that accompanied this recommendation.

5. Are there specific activities or exposures that can be correlated with the development of carpal tunnel syndrome?

6. Do any of the selected conservative treatments result in relief of symptoms and/or functional improvement while resulting in minimal complications? Or do they play a role in diagnosis or prediction of prognosis (injections)?

7. For patients with symptoms consistent with CTS, does surgical carpal tunnel release relieve symptoms and/or improve function?

8. For patients with symptoms consistent with CTS, do adjunctive/alternative surgical techniques relieve symptoms and/or improve function?

9. For patients with symptoms consistent with CTS (median nerve involvement at the level of the wrist) with bilateral involvement, does simultaneous bilateral surgical release relieve symptoms and/or improve function without negative consequence?

10. For pregnant women with symptoms consistent with CTS (median nerve involvement at the level of the wrist) are the selected conservative treatments safe and do they relieve symptoms and/or improve function with minimum complications?
11. For patients undergoing surgical treatment for CTS (median nerve involvement at the level of the wrist) do patient oriented outcomes differ between various modes of anesthesia?

12. For patients undergoing surgical treatment for CTS (median nerve involvement at the level of the wrist), do various post-operative complications significantly differ between those who undergo peri-operative anticoagulation cessation only, with those who undergo continued anti-coagulation treatment.

13. For patients undergoing surgical treatment for CTS (median nerve involvement at the level of the wrist), are there significant differences in infection rates between those treated with prophylactic antibiotics and those not treated with prophylactic antibiotics peri-operatively.

14. For patients who have been treated with a surgical intervention for CTS, is therapy indicated? If so, who, when, what (certain treatments), and how long (duration of therapy)?

15. For patients who have been treated with a surgical intervention for CTS, does post-operative immobilization result in significant differences in symptom relief and functional improvement, as compared to those who undergo early mobilization or unrestricted movement.

16. For diabetic patients who have been treated with a surgical intervention for CTS, which post-operative management modalities are safe and effective?
APPENDIX IV
STUDY ATTRITION FLOWCHART

10804 abstracts reviewed. Search performed on February 27, 2015

8341 articles excluded from title and abstract review

2463 articles recalled for full text review

2233 articles excluded after full text review for not meeting the a priori inclusion criteria or not best available evidence

230 articles included after full text review and quality analysis
APPENDIX V
LITERATURE SEARCH STRATEGIES

Guideline: Diagnosis and Treatment of Carpal Tunnel Syndrome
Total citations added to the database: 691 Ref IDs: 14542-15449 Date: 02/27/2015

Database: PubMed (http://www.pubmed.gov) Date searched: 02/27/2015
Search Results: 314 De-duplicated: 305 Ref IDs: 14542-14855

Search Strategy
#1
“carpal tunnel syndrome”[mh] OR “carpal tunnel”[tw] OR (carpal[tw] AND tunnel[tw])

#2

#3

#4
(#1 OR #2) NOT #3

#5

#6
("2014/02/27"[Date-Entrez] : "3000"[Date-Entrez])

#7
#5 AND #6

PubMed Search Results
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</tr>
</thead>
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<tr>
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<td>305</td>
<td>14542-14855</td>
</tr>
</tbody>
</table>

*De-duplication also removes retracted articles.
Database: Embase ([http://www.embase.com](http://www.embase.com)) Date searched: 02/27/2015  
Search Results: 560 De-duplicated: 376 Ref IDs: 14861-15415  
Search Strategy  
#1  
'carpal tunnel syndrome'/exp OR 'carpal tunnel questionnaire'/exp OR 'carpal tunnel':ab,ti OR  
('median neuropathy':ab,ti OR 'median entrapment':ab,ti OR 'median nerve':ab,ti AND  
('carpal':ab,ti OR 'wrist':ab,ti OR 'distal':ab,ti))  
#2  
#3  
cadaver/de OR 'in vitro study'/exp OR 'abstract report'/de OR book/de OR editorial/de OR  
note/de OR letter/de OR 'case report':ti  
#4  
(#1 AND #2) NOT #3  
Embase Search Results  
<table>
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<tr>
<td>560</td>
<td>376</td>
<td>14861-15415</td>
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</table>

Database: The Cochrane Library (Wiley interface) Date searched: 02/27/2015  
Search Results: 37 De-duplicated: 10 Ref IDs: 15416-15449  
Search Strategy  
#1  
"carpal tunnel":ti,ab,kw (Word variations have been searched)  
#2  
MeSH descriptor: [Carpal Tunnel Syndrome] explode all trees  
#3  
#1 or #2 from 1966 to 2015  
Cochrane Search Results  
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<th>Search Results</th>
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<tr>
<td>37</td>
<td>10</td>
<td>15416-15449</td>
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*Foreign language also removed.*
Search Results: 6 De-duplicated: 0 Ref IDs: --

Search Strategy

**Abstract & Title:** carpal tunnel  
**Published since:** 1966

PEDro Search Results

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<th>Search Results</th>
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<tr>
<td>6</td>
<td>0</td>
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</table>

*Foreign language also removed.
APPENDIX VI
COMPANION CONSENSUS STATEMENTS

For PICO questions which returned no evidence, the guideline development group is given the option to form a consensus statement. PICO questions which did not have supporting evidence can be found in Appendix III. If the guideline development group makes the decision to construct consensus statements, they participate in a modified Delphi method designed to help target the most clinically applicable consensus statement (see Companion Consensus Statement Protocol). All consensus statements will be published in a separate document in an effort to clearly distinguish between the evidence-based recommendations in this document and the complimentary consensus statements. All companion consensus statements can be found on the AAOS website (www.aaos.org). Although expert opinion is a form of evidence, it is also important to avoid liberal use in a guideline since research shows that expert opinion can be incorrect.

Sometimes guideline development group members change their views. At any time during the discussion of the consensus statements, any member of the guideline development group can make a motion to withdraw a statement. Appendix III of the guideline will list all PICO questions, including those that returned no evidence/have consensus statements.

COMPANION CONSENSUS STATEMENT PROTOCOL

If the criteria below are met, the consensus statement will be included in the guideline. All results of the Delphi process will be listed alongside the consensus recommendation or in the appendix of the guideline.

1. The 2nd Round median group rating must be in the clinically accurate range
2. The 2nd Round group ratings must not result in disagreement (see Table 1)
APPENDIX VII

PARTICIPATING PEER REVIEW ORGANIZATIONS

Peer review of the guideline is completed by interested external organizations. The AAOS solicits reviewers for each guideline. They consist of experts in the topic area and represent professional societies other than AAOS. Review organizations are nominated by the guideline development group at the introductory meeting. For this guideline, AAOS contacted 18 organizations with content expertise to review a draft of the clinical practice guideline during the peer review period from September 8th, 2015 to October 8th, 2015. Eleven individuals provided comments via the electronic structured peer review form, representing seven professional medical organizations (listed below).

Participating Societies

- American Academy of Physical Medicine and Rehabilitation (AAPM&R)
- American Society of Plastic Surgeons (ASPS)
- American Association for Hand Surgery (AAHS)
- American Society of Hand Therapists (ASHT)
- American Academy of Neurology (AAN)
- American Association of Neuromuscular and Electromyographic Medicine (AANEM)
- American Society for Surgery of the Hand (ASSH)

Peer review comments will be available on www.aaos.org/guidelinepeerreview.

Participation in the AAOS guideline peer review process does not constitute an endorsement nor does it imply that the reviewer supports this document.
STRUCTURED PEER REVIEW FORM
Peer reviewers are asked to read and review the draft of the clinical practice guideline with a particular focus on their area of expertise. Their responses to the answers below are used to assess the validity, clarity, and accuracy of the interpretation of the evidence.

<table>
<thead>
<tr>
<th>1. The overall objective(s) of the guideline is (are) specifically described.</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<tr>
<td>2. The health question(s) covered by the guideline is (are) specifically described.</td>
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<td>3. The guideline’s target audience is clearly described.</td>
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<td>4. The guideline development group includes individuals from all the relevant professional groups.</td>
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<td>5. There is an explicit link between the recommendations and the supporting evidence.</td>
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<td>6. Given the nature of the topic and the data, all clinically important outcomes are considered.</td>
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<td>7. The patients to whom this guideline is meant to apply are specifically described.</td>
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<td>8. The criteria used to select articles for inclusion are appropriate.</td>
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<td>9. The reasons why some studies were excluded are clearly described.</td>
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<tr>
<td>10. All important studies that met the article inclusion criteria are included.</td>
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<td>11. The validity of the studies is appropriately appraised.</td>
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<td>12. The methods are described in such a way as to be reproducible.</td>
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<tr>
<td>13. The statistical methods are appropriate to the material and the objectives of this guideline.</td>
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<tr>
<td>14. Important parameters (e.g., setting, study population, study design) that could affect study results are systematically addressed.</td>
<td></td>
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<tr>
<td>15. Health benefits, side effects, and risks are adequately addressed.</td>
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<td>16. The writing style is appropriate for health care professionals.</td>
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<tr>
<td>17. The grades assigned to each recommendation are appropriate.</td>
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</table>
Please provide a brief explanation of both your positive and negative answers in the preceding section. If applicable, please specify the draft page and line numbers in your comments. Please feel free to also comment on the overall structure and content of the Guideline.

Would you recommend these guidelines for use in clinical practice?
- Strongly Recommend
- Recommend
- Would Not Recommend
- Unsure

Additional Comments:

To view an example of the structured peer review form, please select the following link: Structured Peer Review Form
APPENDIX VIII
INTERPRETING THE FOREST PLOTS

We use descriptive diagrams known as forest plots to present data from studies comparing the differences in outcomes between two treatment groups when a meta-analysis has been performed (combining results of multiple studies into a single estimate of overall effect). The overall effect is shown at the bottom of the graph as a diamond to illustrate the confidence intervals. The standardized mean difference or odds ratio are measures used to depict differences in outcomes between treatment groups. The horizontal line running through each point represents the 95% confidence interval for that point estimate. The solid vertical line represents “no effect” and is where the standardized mean difference = 0 or odds ratio = 1.
APPENDIX IX
CONFLICT OF INTEREST
Prior to the development of this guideline, guideline development group members disclose conflicts of interest (COI). They disclose COIs in writing to the American Academy of Orthopaedic Surgeons via a private on-line reporting database and also verbally at the recommendation approval meeting.

Brent Graham, MD, Work Group Chair: Journal of Bone and Joint Surgery - American: Editorial or governing board; Publishing royalties, financial or material support (Submitted on: 05/06/2015)

Allan E Peljovich, MD, Work Group Vice-Chair: AAOS: Board or committee member; American Society for Surgery of the Hand: Board or committee member (Submitted on: 10/01/2015)

Robert Afra, MD: (This individual reported nothing to disclose); Submitted on: 05/07/2015

Mickey S Cho, MD: American Society for Surgery of the Hand: Board or committee member (Submitted on: 05/07/2015)

Robert Gray, MD: American Society for Surgery of the Hand: Board or committee member; Skeletal Dynamics: Paid presenter or speaker (Submitted on: 04/23/2015)

Andrew Gurman, MD: I am a member of the Board of Trustees of the American Medical Association, which is the publisher of JAMA and Archives of Surgery: Editorial or governing board; I am the Speaker of the House of Delegates and a member of the Board of Trustees of the American Medical Association: Board or committee member (Submitted on 04/29/2015)

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Gary Mlady, MD: (This individual reported nothing to disclose); Submitted on: 04/14/2015

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David Rempel, MD: American College of Occupational and Environmental Medicine: Board or committee member; Applied Ergonomics: Editorial or governing board; Human Factors: Editorial or governing board; Occupational and Environmental Medicine/Lange: Publishing royalties, financial or material support (Submitted on: 04/29/2015)

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John Michael Stephenson, MD: American Society for Surgery of the Hand: Board or committee member; Journal of Hand Surgery - American: Editorial or governing board
Michael Warren Keith, MD, Work Group Oversight Chair: AAOS: Board or committee member; Neuros: Unpaid consultant (Submitted on: 04/02/2015)

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John D Lubahn, MD: Auxillium - Xiaflex: Research support (Submitted on: 10/14/2015)

Wilson Ray, MD: DePuy, A Johnson & Johnson Company: Paid consultant; LDR Holding: Stock or stock Options; Ulrich: Paid consultant (Submitted on: 05/01/2015)

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AAOS Staff

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Jayson Murray, MA: (This individual reported nothing to disclose); Submitted on: 05/19/2015

Mukarram Mohiuddin: (This individual reported nothing to disclose); Submitted on: 10/13/2015

Kyle Mullen: No disclosure available
Anne Woznica: (This individual reported nothing to disclose); Submitted on: 10/01/2015

Peter Shores: (This individual reported nothing to disclose); Submitted on: 10/01/2015

Erica Linskey: (This individual reported nothing to disclose); Submitted on: 10/01/2015

Yasseline Martinez: (This individual reported nothing to disclose); Submitted on: 04/02/2015

Disclosure Items: (n) = Respondent answered 'No' to all items indicating no conflicts. 1 = Royalties from a company or supplier; 2 = Speakers bureau/paid presentations for a company or supplier; 3A = Paid employee for a company or supplier; 3B = Paid consultant for a company or supplier; 3C = Unpaid consultant for a company or supplier; 4 = Stock or stock options in a company or supplier; 5 = Research support from a company or supplier as a PI; 6 = Other financial or material support from a company or supplier; 7 = Royalties, financial or material support from publishers; 8 = Medical/Orthopaedic publications editorial/governing board; 9 = Board member/committee appointments for a society.
APPENDIX X
BIBLIOGRAPHIES
INCLUDED STUDIES


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<td>Can wrist splints or steroid injections reduce the need for decompression surgery in carpal tunnel syndrome? (Structured abstract)</td>
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<td>1994</td>
<td>Endoscopic Carpal Tunnel Release</td>
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<td>1986</td>
<td>Carpal tunnel syndrome</td>
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<td>Functional outcomes post carpal tunnel release: a modified replication of a previous study</td>
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APPENDIX XIII
LETTERS OF ENDORSEMENT FROM EXTERNAL ORGANIZATIONS

December 15, 2015

David Teuscher, MD

Dear Dr. Teuscher:

During the recent Council meeting of the ASSH last week, we considered the AAOS draft of the Clinical Practice Guidelines for Carpal Tunnel Syndrome. In addition to all the information provided by the Academy, Charles Goldfarb, MD, chair of our Evidence-based Practice Committee, provided a detailed evaluation of the guidelines.

After discussion, the ASSH Council approved endorsement of these guidelines. Please let us know if you need any other opinion or response from us.

Yours sincerely,

Neil Jones

Neil F. Jones, MD
President

cc: Kevin Bozic, MD
    Karen Hackett, FASAE, CAE
    Deborah Cummins
    Jeffrey Greenberg, MD, Practice Division Director
    Mark C. Anderson, FASAE, CAE, EVP
May 12, 2016

Kevin Shea, MD  
American Academy of Orthopaedic Surgeons  
Intermountain Orthopaedics  
600 N. Robbins Rd., Ste. 400  
Boise, ID 83702

Dear Dr. Shea,

The American Society of Plastic Surgeons has voted to endorse the AAOS Clinical Practice Guideline on the Management of Carpal Tunnel Syndrome. This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

[Signature]

David H. Song, MD, MBA, FACS  
President

cc: Andrea Pusic, MD, MHS, FACS, FRCSC  
William Wooden, MD, FACS  
Keith M. Hume, MA  
Carol Sieck, RN, MSN  
Lauren Loeding, MPH
March 15, 2016

Erica Linskey
Administrative Assistant, Evidence-Based Medicine Unit
American Academy of Orthopedic Surgeons
9400 West Higgins Road
Rosemont, Illinois 60018

Dear Ms. Linskey,

The Board of Chancellors of the American College of Radiology hereby endorses 2015 AAOS Clinical Practice Guideline on the Management of Carpal Tunnel Syndrome effective February 26, 2016. We look forward to working with you in the future.

Sincerely,

[Signature]

William T. Thorwarth Jr., MD, FACP
Chief Executive Officer
March 2, 2016

American Academy of Orthopaedic Surgeons
9400 West Higgins Road
Rosemont, Illinois 60018-4976

ATTN: Kevin Shea, MD
AAOS Clinical Practice Guidelines Section Leader
of the Committee on Evidence-Based Quality and Value

Dear Kevin Shea, MD,

The American College of Surgeons has voted to endorse the AAOS Clinical Practice Guideline on the Management of Carpal Tunnel Syndrome. This endorsement implies permission for the AAOS to officially list our organization as an endorser of this guideline and reprint our logo in the introductory section of the guideline document.

Sincerely,

David B. Hoyt, MD, FACS
Executive Director
March 28, 2017

Kevin Shea, M.D.
American Academy of Orthopaedic Surgeons
Clinical Practice Guidelines Section Leader
of the Committee on Evidence-Based Quality and Value
9400 West Higgins Road
Rosemont, Illinois 60018

Dear Dr. Shea,

Thank you for providing the American Society of Anesthesiologists (ASA) the opportunity to review the American Academy of Orthopaedic Surgeons (AAOS) Clinical Practice Guideline on the Management of Carpal Tunnel Syndrome. I am pleased to share that ASA's leadership has approved ASA’s endorsement of the Clinical Practice Guideline on the Management of Carpal Tunnel Syndrome.

The following parties reviewed the document: ASA’s Committee on Regional Anesthesia, Administrative Council and Board of Directors.

ASA’s Committee on Regional Anesthesia looks forward to providing input on subsequent versions of the guideline if requested. Thank you again for the opportunity to collaborate with AAOS and participate in the review of this Clinical Practice Guideline.

Sincerely,

Jeffrey Plagenhoef, M.D.
President
American Society of Anesthesiologists