Diagnosis and treatment of worker-related musculoskeletal disorders of the upper extremity: cubital tunnel syndrome

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Authors' objectives
The objectives were to assess the effectiveness of diagnostic tests for cubital tunnel syndrome (CuTS), and to assess the harms and benefits of surgical and nonsurgical interventions for patients with this syndrome.

The report also assesses the diagnosis and treatment of carpal tunnel syndrome, epicondylitis and de Quervain's disease. This abstract only deals with CuTS; the other disorders are dealt with in other DARE abstracts (DARE abstract numbers 12003008727, 12003008729, 12003008730).

Searching
The sources searched included 31 electronic databases, the World Wide Web, the bibliographies and reference lists of all identified studies, Current Contents (Clinical Medicine), and 1,600 journals and supplements maintained in the ECRI collections. Full details were provided of all electronic databases and web sources searched. Studies were only included if they were published in English. The paper reported details of the search strategy.

Study selection
Study designs of evaluations included in the review

Diagnosis.
Prospective and retrospective studies were eligible regardless of the presence of a concurrent control group. Case series and other reports were only included if they were published in 1980 or later. Case series had to enrol 10 or more patients. The included studies were all diagnostic case-control studies.

Effectiveness.
Controlled trials were eligible for inclusion regardless of the use of randomisation or blinding, or whether they were prospective or retrospective. Studies were only included if they had no serious design flaw that precluded an interpretation of the results.

Specific interventions included in the review

Diagnosis.
Studies were included if they did not use obsolete tests. The identified studies used many different tests including composite nerve conduction tests, imaging, nerve conduction, and signs or symptoms. The text in the review only discussed ulnar nerve motor conduction velocity at the elbow.

Effectiveness.
Studies that compared treatment with placebo, sham or no treatment, or compared two or more treatments, were eligible for inclusion. Studies that compared highly similar treatments were excluded. The included studies compared anterior transposition with decompression or epicondylectomy, or compared different types of anterior transposition operations.

Reference standard test against which the new test was compared
The inclusion criteria for diagnostic studies were not specified in terms of a reference standard test. The included studies used a variety of different definitions for CuTS symptoms and motor nerve conduction velocity across the elbow, and combinations of clinical and nerve conduction tests. The review listed all reference tests used.
Participants included in the review

Studies of patients diagnosed with worker-related CuTS were eligible for inclusion. The review defined worker-related as a disorder that affects workers.

Diagnostic studies generally compared patients with CuTS with healthy normal people.

The participants in the included effectiveness studies had a mean age in the 40s or 50s and were predominantly male.

Outcomes assessed in the review

Diagnosis.

The studies had to report data that could be used to evaluate the test.

Effectiveness.

Studies that assessed any of the following patient-orientated outcomes were eligible for inclusion: pain, functional activity, quality of life, return to work, return to activities of daily living, harms, and global measures such as patient satisfaction and overall relief of symptoms. The review did not assess surrogate outcomes.

How were decisions on the relevance of primary studies made?

Six reviewers independently selected the studies for inclusion.

Assessment of study quality

Diagnosis.

Studies were assessed for: source of funding; prospective or retrospective selection of the patients; patient inclusion and exclusion criteria; reporting of the sex distribution; less than 20% sex difference between the patients and controls; reporting of the patients' age; the mean age of patients within 5 years of controls; reporting of the duration of the medical condition; reporting of co-morbidities; blinding of the test operator; blinding of the test reader; multiple test readers; method used for multiple test readers; test compared with independent reference standard; all patients given test and reference standard; and generalisability.

Effectiveness.

Studies were assessed for: sample size; the percentage of patients undergoing bilateral procedures and potential for violation of assumption of independence; the number of study centers; funding by a for-profits stakeholder; blinding; total patient attrition; intention-to-treat analysis; and generalisability.

The authors did not state how the papers were assessed for validity, or how many reviewers performed the validity assessment.

Data extraction

The data were abstracted onto electronic data abstraction forms, but the authors did not state how many reviewers performed the data extraction. Separate forms were used for studies of diagnosis (and for each diagnostic test) and effectiveness.

Diagnosis.

Where possible, data were extracted to complete 2x2 tables. The reviewers calculated the sensitivity and specificity for studies evaluating ulnar motor nerve conduction velocity at the elbow and verified reported values.

Effectiveness.

For each study presenting adequate data, the effect size and 95% confidence interval (CI) were estimated using Hedge's
‘d’. For studies assessing outcomes using rating scales, the reviewers calculated the mean for each treatment group. The reviewers converted outcomes reported as odds ratios into Hedge’s ‘d’. Where possible, the minimum between-group difference that each study had the power to detect was calculated. The statistical significance of differences between the treatment groups was assessed in terms of patient characteristics and pre-treatment effect sizes. Wherever possible, the reviewers recalculated effectiveness data from studies with patient attrition by making conservative assumptions about outcomes among drop-outs.

**Methods of synthesis**

**How were the studies combined?**

**Diagnosis.**

There were no tests with at least 10 studies reporting the sensitivity and specificity, which was the minimum number of studies required for undertaking meta-analysis. Studies of ulnar motor nerve conduction velocity at the elbow were combined in a narrative with accompanying tables.

**Effectiveness.**

The studies were combined in a narrative with accompanying tables.

**How were differences between studies investigated?**

Differences between the studies were presented using a tabular format.

**Results of the review**

**Diagnosis:** 22 studies met the inclusion criteria. Twenty studies (at least 1,005 patients) contained diagnostic data, but only 9 studies presented adequate data for extraction or the calculation of sensitivity and specificity, and only 3 studies were described in the text of the report.

**Effectiveness:** 3 controlled studies (301 patients) were included. There was one randomised controlled trial (RCT; 52 patients), one retrospective study (214 patients) and one controlled study with unclear design (35 patients).

**Diagnosis.**

Methodological problems included a lack of blinding of the test operators and readers, inadequate reporting of the patients’ age and sex, lack of objective criteria to define CuTS, and the use of normal healthy people as controls (thus leading to potential spectrum bias).

There were insufficient data to draw evidence-based conclusions about the effectiveness of any diagnostic tests for CuTS.

Ulnar nerve motor conduction velocity at the elbow (3 studies): studies found low sensitivity and high specificity (28.5% and 95.8%; 66.7% and 100%; and 32% and 97.1%).

**Effectiveness (3 controlled trials).**

Methodological problems included a lack of randomisation, lack of blinding, lack of intention-to-treat analysis, and violation of the assumption of patient independence by analysing arms rather than individual patients.

Medial epicondylectomy: one RCT (52 patients) found that medial epicondylectomy significantly improved pain (\(d=0.73, 95\% \ CI: 0.17, 1.29, P=0.02\)) and global outcome scores at 54 months (\(d=0.74, 95\% \ CI: 0.08, 1.40, P<0.05\)) compared with anterior transposition. Two non-randomised trials found no statistically significant difference in global outcomes between treatments.

There were insufficient data to assess the rates of surgical complications for any surgical procedures.
Cost information
The authors also searched four additional U.S. Government datasets to obtain information about the costs. The average total charges per patient for the diagnosis-related group (DRG) of major shoulder/elbow procedures with co-morbidities or complications were $9,008.94; for DRG shoulder, elbow or forearm without co-morbidities or complications, these were $7,729.17; and for DRG peripheral and cranial nerves and other nerve procedures without co-morbidities or complications, these were $14,357.65 (with co-morbidities or complications $24,288). The reported median cost for decompression fasciotomy of the forearm and/or wrist was $603.85.

Authors' conclusions
Overall, the studies were generally of a low quality, making it difficult to draw conclusions. The studies suggested trends rather than providing quantitative results. Diagnosis. There were insufficient data to draw evidence-based conclusions about the effectiveness of any diagnostic test for CuTS. Effectiveness. The limited evidence from one small RCT suggested that medial epiconylectomy improved pain and global outcome scores in comparison with anterior transposition.

CRD commentary
The review question was clear in terms of the study design, participants and outcomes. Eligible interventions were not specified, but this seems appropriate in view of the wide-ranging nature of the review. The literature search was restricted to English language publications and might have excluded some relevant data. More than one reviewer independently selected the studies, thus reducing the potential for bias and errors. The subsequent exclusion of some studies that met the inclusion criteria suggests that more rigorous inclusion criteria may have been appropriate. The methods used to assess validity and extract the data were not described; hence, any efforts made to reduce errors and bias cannot be judged. Validity was assessed and some methodological limitations were discussed.

Given the small number of identified studies, a narrative synthesis was appropriate. The authors' conclusions regarding the inadequacy of the evidence are likely to be reliable.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.
Research: The authors stated that well-designed diagnostic studies are needed to address many issues around work-related upper extremity disorders. In the absence of a 'gold' standard test, longitudinal studies are the most appropriate for assessing diagnostic tests. If a gold standard test was developed, then single-arm cross-sectional studies comparing the results of the gold standard test with those of the test under investigation would be appropriate. Studies should select patient populations that closely resemble the general population on whom the diagnostic test would be used.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.