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Treatment outcome in carpal tunnel syndrome: Does distribution of sensory symptoms matter?

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ABSTRACT

Background: Patients with complaints of carpal tunnel syndrome (CTS) with signs and symptoms not exclusively confined to the median nerve territory, but otherwise fulfilling the clinical criteria may erroneously be withheld from therapy.
Methods: One hundred and twenty one patients who fulfilled the clinical criteria for the diagnosis of CTS with signs and symptoms restricted to the median nerve territory (group A) and 91 patients without this restriction (group B) were included in a prospective cohort study. All patients fulfilled electrodiagnostic criteria of CTS. Outcome was determined after 7 to 9 months by means of Symptom Severity Score (SSS) and Functional Status Score (FSS) according to Levine and a patient satisfaction questionnaire.
Results: Response rates were 81.8% (group A) and 82.4% (group B). All patients in group B had sensory symptoms involving digit 5. There were no significant differences in improvement of SSS, FSS and patient satisfaction scores between groups after treatment.
Conclusion: CTS patients with characteristic sensory signs and symptoms not exclusively restricted to the median nerve innervated area should be treated in the same manner as patients with CTS symptoms restricted to the median nerve innervated area and should therefore not be withheld from surgical treatment.

1. Introduction

Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy [1,2]. Diagnosis is based on clinical signs and symptoms that typically show existence of nocturnal acroparesthesia in the area innervated by the median nerve. If CTS signs and symptoms are typical, these may easily and reliably lead to a definite diagnosis on clinical grounds exclusively. However, it is well known that a substantial number of CTS patients report signs and symptoms in the whole hand, which may eventually lead to uncertainty of the diagnosis of CTS. This may discourage the performance of an operative decompression of the median nerve or other types of intervention. Contrary to most other surgeons in the Netherlands, some surgeons do not require electrodiagnostic confirmation prior to operation in the case of a definite clinical diagnosis of CTS [3,4]. However, in patients with complaints outside the anatomical median nerve territory, hesitation may arise even if they fulfill electrodiagnostic criteria for CTS. As a consequence, this may exclude patients from proven effective operative therapy. The present study was conducted to determine whether CTS patients with signs and symptoms not solely confined to the median nerve innervated area, which in addition were electrodiagnostically confirmed, benefit from treatment to the same extent as patients who do fit classic clinical CTS criteria.

2. Materials and methods

2.1. Patients

In this prospective cohort study, patients with complaints suggestive of CTS were referred to our outpatient clinic by their general practitioner. Patients were included if they fulfilled clinical criteria for CTS as well as electrodiagnostic criteria. Patients were divided into two groups according to strict clinical criteria having a typical, 'classic' CTS (group A, CCTS) or less typical, 'non-classic' CTS (group B, NCTS). Criteria were adapted from Witt et al., who distinguished patients with 'definite' and 'possible' CTS [5]. Patients with paresthesia and/or pain in the median nerve innervated area and 2 or more major criteria (Table 1) were defined as having classic CTS. Patients with paresthesia and/or pain in the median nerve innervated area and the fifth finger and 1 major or 2 minor criteria were categorized as non-classic CTS. Involvement of the fifth finger was indicated by history and confirmed in the Katz diagram [6]. Patients with sensory symptoms outside the classic

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Table 1
Major and minor criteria in diagnosing CTS.

Major criteria
1) Nocturnal paresthesia
2) Positive Flick sign
3) Aggravation by driving, holding a book or telephone
Minor criteria
1) Subjective weakness
2) Clumsiness of the hand
3) Positive Tinel or Phalen sign

Flick sign: paresthesia relieved by shaking the hand or holding it in a dependent position.

median nerve innervated area were thus classified as 'non-classic' CTS patients. When both hands were affected, the hand with the most severe complaints was included. Other exclusion criteria were age under 18, a significant language barrier, mental disorder, clinical signs of polyneuropathy, a history of wrist trauma or surgery, pregnancy, severe thenar atrophy, alcoholism, arthritis or arthrosis of the wrist, known diabetes mellitus, rheumatoid arthritis or thyroid dysfunction, HNLPP (Hereditary Neuropathy with Liability to Pressure Palsies), other known causes of the complaints and a bifid median nerve on ultrasound imaging. Patients filled in a Symptom Severity Score (SSS) and Functional Status Score (FSS) according to Levine [7] before treatment and 7 (90% of the scores) or ultimately 9 months (some responded after a second call) after treatment. This is a validated patient-reported outcome measure for studies involving CTS [8]. Patients also received a multiple choice questionnaire to indicate their satisfaction with treatment result. The study was approved by the regional medical ethics committee. Written informed consent was obtained from each patient prior to inclusion. Electrodiagnostic reference values were collected in the same laboratory by examining 47 asymptomatic volunteers.

2.2. Clinical testing

All patients were clinically examined by experienced examiners. A complete neurological examination was performed. Tinel and Phalen signs were tested, and sensory examination was performed with a monofilament (10 g) and two-point discrimination. Motor function was tested according to MRC (Medical Research Council) as well as grip strength with a Martin vigorimeter [9]. Thenar atrophy was classified as absent, mild or severe. Patients with severe thenar atrophy were excluded from this study.

2.3. Electrodiagnostic testing

All patients underwent electrodiagnostic tests performed with standardized techniques according to the AANEM summary statement [10] and by an experienced neurophysiologist who was blinded for clinical data. Electrodiagnostic studies were performed on the same day for each subject. All tests were performed with a Viking myograph type IV (Nicolet Biomedical, Madison, WI, USA). We used earlier developed reference values that were obtained in the same laboratory by means of the same procedure as applied in the present study. Skin temperature was maintained at 31 °C or more during the test procedure. It was measured at the recording site by means of an infrared thermometer (62 Mini IR thermometer, Fluke Biomedical, Cleveland OH, USA) before and after performing the tests. Three different kinds of sensory nerve conduction studies were performed in each individual, as well as one motor nerve conduction study. Difference between onset latencies of the median nerve and ipsilateral ulnar nerve were recorded from the fourth finger over the same distance. Conduction velocity of the ulnar nerve should be at least 50 m/s. A difference in onset latency of more than 0.4 ms or the absence of the median sensory nerve action potential (SNAP) is considered to be consistent with CTS. SNAPs from median and radial nerves were recorded from the first finger after stimulation of the median and radial nerve at the wrist, with the same conduction distance. A difference in onset latency of more than 0.6 ms or absence of the median SNAP is considered to be consistent with CTS. Segmental sensory conduction studies across the wrist recorded SNAPs from digits 2 and 3 after stimulation of the median nerve at the palm and at the wrist. Absence of SNAPs or a difference in conduction velocity between the palm-to-digit and palm-to-wrist greater than 10 m/s is considered to be consistent with CTS. Median motor nerve conduction studies were performed by stimulating the median nerve at the wrist and at the cubital fossa. A distal motor latency of more than 4.0 ms is considered to be consistent with CTS. For an EDX result to be consistent with CTS, at least 2 tests had to be abnormal.

2.4. Statistical analysis

Data concerning clinical variables and nerve conduction studies were processed using Microsoft Office Excel and Access and all statistical analyses were performed using SPSS Statistics 17.0. Comparison between patients and controls was performed with a t-test for continuous variables or a χ^2 test for categorical variables, as appropriate, and, in case of non-nominal distribution, the Mann–Whitney U test. $P < 0.05$ was considered to be statistically significant.

2.5. Treatment

Patients who fulfilled clinical criteria for group A or B and who had EDX corresponding with CTS criteria were informed about the study objectives. We discussed the different treatment options with patients: conservative treatment with a wrist splint during the night, local corticosteroid injection (methylprednisolone 40 mg) at the carpal tunnel or surgical decompression of the median nerve at the carpal tunnel. Patients were informed on treatment options according to the Dutch Consensus Guideline [11] for diagnosis and treatment of carpal tunnel syndrome. They were explained that on the long-term, surgical treatment could be expected to have the best treatment results [11-14]. Surgery was performed by experienced neurosurgeons under local anesthesia with an open surgical procedure.

2.6. Follow-up

The neurosurgeon performed the follow-up for removal of stitches and control of wound healing of the surgically treated patients 1 and 4 weeks after the operation. Six months after treatment all patients were sent the Symptom Severity Score and Functional Severity Score according to Levine [7]. We also sent a multiple choice questionnaire in which patients were asked to indicate the effect of treatment (no complaints, rarely any, occasional complaints, often, situation unchanged or deterioration). For the purpose of statistical analysis, we divided these options into four categories: 1) full recovery, 2) partial recovery, 3) no recovery at all, and 4) deterioration.

3. Results

3.1. Patients

Two hundred and twenty eight patients who initially met the inclusion criteria were selected: 131 patients with clinical 'classic' CTS (group A) and 97 patients with clinical 'non-classic' CTS (group B). Sixteen patients with a bifid median nerve on US were excluded, 10 in group A and 6 in group B. Clinical features of the patients are presented in Table 2. In group B, all patients presented with sensory symptoms or signs in median nerve sensory territory and in digit 5. There was a significantly higher percentage of women in group B (72.7% vs. 86.8%, $P = 0.013$). No statistically significant differences were found in age, duration of symptoms, BMI, weakness or atrophy of the abductor pollicis brevis muscle, sensory loss or occurrence of Tinel or Phalen