Multicenter study on carpal tunnel syndrome and pregnancy incidence and natural course

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Summary

Objective. To evaluate the incidence of carpal tunnel syndrome (CTS) in pregnancy through a validated and multiperspective assessment of CTS and to assess the course of carpal tunnel syndrome after pregnancy.

Methods. During 2000–2001, the Italian CTS study group in 7 Italian centers studied the occurrence of CTS in women during the last period of pregnancy. The group enrolled and followed-up (10–15 months) 63 women during and after pregnancy with multiple measurements of CTS. In addition to the physician-centered and neurophysiologic traditional evaluations, a validated patient-oriented measurement to obtain more comprehensive and consistent data for severity of symptoms and functional impairment was adopted.

Results. CTS was clinically diagnosed in more than half of women (62%). Neurophysiological evaluation provided diagnosis of CTS in around half of women (43% were positive in one hand at least). Comparison of baseline and follow-up data showed a significant spontaneous improvement of patient-oriented and neurophysiologic measurements. Nevertheless, about half of women with CTS during pregnancy still complained of CTS symptoms one year after delivery.

Conclusions. Our observations confirmed the frequent occurrence of CTS in pregnancy. At follow-up we observed that most CTS cases improve spontaneously without treatment but only in half of women CTS symptoms disappeared one year after delivery.

Keywords: Carpal tunnel syndrome; natural history; pregnancy; delivery; multicenter; outcome; neurophysiology.

Introduction

One of the most frequent physiological conditions associated with carpal tunnel syndrome (CTS) is pregnancy [2, 5, 8]. CTS frequently causes disability [10] and hand disability in a woman during puerperium may be particularly severe. Therefore evolution of CTS after delivery is an important issue.

During 2000 and 2001 [11, 12], the Italian CTS study group studied

1) the incidence of CTS during pregnancy in women enrolled in 7 Italian centers
2) the evolution of CTS after delivery and lactation
3) the predictive factors for occurrence of CTS during pregnancy and evolution of CTS after delivery

In addition to the physician-centered and neurophysiologic traditional evaluations the group used a validated patient-oriented measurement to obtain more comprehensive and consistent data for the clinical picture.

Study design

Data collection at the initial evaluation

Each center had to provide at least 10 consecutive women, who were in their 8th and 9th months, monitored in the Department of Obstetrics and Gynecology.

Study design was extensively reported previously [11, 12].

Clinical diagnosis of CTS

Clinical diagnosis of CTS was based on the AAN (AAN, 1993a) clinical diagnostic criteria summarized here: paresthesia, pain, swelling, weakness or clumsiness of the hand provoked or worsened by sleep, sus-
tained hand or arm position, repetitive action of the hand or wrist that is mitigated by changing posture or by shaking of the hand; sensory deficits in the median innervated region of the hand and motor deficit or hypotrophy of the median innervated thenar muscles.

A detailed clinical history, a careful clinical examination and extended neurophysiologic evaluation (described later) were always performed to exclude the presence of other diseases that could be related to CTS.

For clinical examination, a historic and objective scale (Hi-Ob) of CTS was used [8]. This scale includes the following two measures. The first measure is a score (Hi-Ob) determined by clinical history and objective findings: 1) nocturnal paresthesia only, 2) nocturnal and diurnal paresthesia, 3) sensory deficit, 4) hypotrophy or motor deficit of the median innervated thenar muscles, and 5) plegia of the median thenar eminence muscles. The second measure of the scale evaluates, by patient-oriented measurement, the presence or absence of pain (PAIN) as dichotomous category score obtained from the patient with a forced-choice answer (yes or no).

Patient-oriented data: Boston Carpal Tunnel Questionnaire (BCTQ)

A patient-oriented validated measurement was used: the Italian version of the BCTQ [10, 15]. The BCTQ evaluates two domains of CTS, namely “symptoms” (SYMPT), assessed with an 11-item scale and “functional status” (FUNCT) assessed with an eight-item scale (each item has five possible responses). Each score (SYMPT and FUNCT) is calculated as the mean of the responses of the individual items.

Electrodiagnostic evaluation

Electrodiagnostic studies were performed according to a protocol [17, 18] inspired by AAN and AAEM recommendations [1–4]. When standard tests (median sensory nerve conduction velocity in two digit/wrist segments and median distal motor latency from the wrist to thenar eminence) yielded normal results, segmental (over short distance of 7 to 8 cm) or comparative studies (e.g. median/unlar comparison) were always performed. The severity of neurophysiologic CTS impairment was assessed by a previously reported neurophysiologic classification [18, 19]. CTS hands are divided into six groups on the basis of neurophysiologic findings: extreme, absence of motor and sensory responses (EXT); severe, absence of sensory response and abnormal distal motor latency (SEV); moderate, abnormal digit/wrist sensory nerve conduction velocity and abnormal distal motor latency (MOD); mild, abnormal digit/wrist sensory nerve conduction velocity and normal distal motor latency (MILD); minimal, abnormal segmental and comparative tests only (MIN); and negative, normal findings on all tests (NEG).

Follow-up

Each centre had to re-evaluate at least 75% of the initially enrolled CTS hands, with a latency between 12 and 15 months from the first evaluation (therefore around one year after delivery).

The evaluation of the evolution was based on the following CTS severity measurements: SYMPT, FUNCT, PAIN, Hi-Ob and neurophysiologic class. In other words, the evolution was assessed by the perspective of the patient (FUNCT, SYMPT and PAIN), and the physician/neurophysiology assessment (Hi-Ob and neurophysiologic class). When the woman was not able to come to the neurophysiologic laboratory she was given a phone interview in which the following data were acquired: 1) historical follow-up data; 2) SYMPT and FUNCT scores (by BCTQ patient-oriented evaluation performed on the phone).

Predictive factors

To judge whether some factors, evaluated at the baseline, may predict the CTS course, CTS severity measurements (SYMPT, FUNCT, Hi-Ob and Neurophysiologic class, as dependent variables) were related to the following data: increment of weight, CTS symptoms before the current pregnancy, smoking and alcohol use, edema, beginning of symptoms. For statistical analysis (multiple regression), these last measurements were considered as independent variables.

To evaluate the percentage of CTS hands with a tangible “improvement”, “worsening” or those remaining “stationary”, we arbitrarily considered: 1) meaningful neurophysiologic worsening or improvement in the CTS hands in which at follow-up (T1) the class moves from the baseline (T0) class to another class (for example: a case is neurophysiologically considered worse when presenting mild class at T0 and mod class at T1); 2) meaningful worsening or improvement on patient-oriented measurements.
(SYMPT or FUNCT) of the CTS hands in which at T1 the score was increased or decreased by 0.5 or more; and 3) meaningful clinical worsening or improvement of the CTS hands, in which at T1 evaluation the clinical score (Hi-Ob) moves from the baseline class to another class. This kind of analysis was adopted in a previous CTS follow-up study [12].

In case of bilateral CTS we considered the hand with more severe symptoms at initial evaluation.

Statistical analysis

Statistical analysis was performed by using the STAT-SOFT (Statistica 4.5, Tulsa, OK) package. Complex statistical analysis was performed and was extensively reported [12, 13].

Results

Seventy-six women in their 8th and 9th months were studied (mean age 31.3, ranging from 20 to 41 years).

Occurrence of CTS: neurophysiological and clinical findings

In our study 59% of cases complained of paraesthesia at least in one hand (85% of these had positive electrodiagnostic findings for CTS at least in one hand). Clinical CTS was diagnosed in more than half of women (62%). Neurophysiological evaluation provided diagnosis of CTS in around half of women (43% were positive in at least one hand).

Edema was related with neurophysiological picture of CTS (right hand p < 0.01, r = 0.3; left hand < 0.05, r = 0.3) and with right BCTQ symptom score (p = 0.02, r = 0.3); no other significant correlations with CTS measurements were detected.

Follow-up

Table 1 reports the follow-up data and statistical results in the re-evaluated pregnant sample with clinical CTS at first evaluation (37 women).

The following analysis was performed only in 37 re-evaluated women who had clinical CTS at initial evaluation (in 95% the more symptomatic hand was the dominant hand).

Totally, at follow up, 20 out of the 37 women (54%) who presented clinical CTS at initial evaluation, presented clinical CTS. No woman out of the 37 with clinical CTS at first evaluation was operated on.

All patient-oriented measurements showed significant improvement of the CTS picture (Table 1). Con-
versely, the comparison of neurophysiologic picture between the baseline and the follow-up did not show differences, but note that only 24 of the 37 patients had initial and follow-up neurophysiologic evaluation. Note that according to all measurements, around one third of patients (from 24% to 38%) with CTS "improved"; around half of patients remained "stationary" (from 46% to 71%) (see Table 2).

Discussion

Some papers focus on the incidence of CTS during pregnancy. Nevertheless the data reported are discordant. (Melvin et al., 1969, Stolp-Smith et al., 1998; 7, 9, 22).

In our study around half of the women in their 8th and 9th months presented clinical and neurophysiological CTS.

Some authors previously reported the correlation between edema in pregnancy and CTS symptoms [7, 22, 23]. Our study confirmed this association and provides evidence never reported before of the correlation between edema and neurophysiologic picture. Similarly, our study provides a correlation between validated patient-oriented measurement and edema. In conclusion our observations confirm that the edema of the tissues in the carpal tunnel, as a result of the tendency for fluid retention, could induce a mechanical compression of the nerve and then it could be an important factor of CTS during pregnancy.

With regard to the evolution after pregnancy, it is common opinion that most CTS resolve after delivery. Only one study systematically evaluated the evolution of untreated CTS through neurophysiologic evaluation, but a test with low sensitivity was used (the study was performed in 1978 and only motor conduction evaluation was performed) [9]. No study assessed the clinical evolution of CTS after delivery through a multiperspective protocol including validated patient-oriented evaluation.

As expected, our data showed that in the sample with CTS at initial evaluation, clinical (Hi-Ob) and patient-oriented (PAIN, SYMPT and FUNCT) measurements significantly improve 1 year after delivery. Conversely, the neurophysiologic picture does not improve, but most patients who improved refused the neurophysiologic evaluation at follow-up; therefore neurophysiologic evaluation at follow-up was performed in a smaller sample and usually in women with CTS symptoms [34]. Although CTS severity measurements improved at follow-up, more than half of the women who had CTS symptoms during pregnancy complained of CTS symptoms one year after delivery [5].

In our study, multiple regression (table 3) analysis showed a strong dependence of each severity measurement at T1 with its T0 value. Severe baseline pictures were associated with a higher probability of improvement at follow-up. Moreover, the factor that is most predictive of untreated CTS evolution is the onset of CTS symptoms during pregnancy. An earlier onset of symptoms is a negative prognostic factor according to all patient-oriented and clinical measurements. According to the neurophysiologic evolution, weight gain appeared predictive: a higher gain implies a lower probability of improvement at follow-up.

Appendix

The members of the Italian CTS Study Group include the following investigators and centers:

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<table>
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<tr>
<th>CTS severity measurements</th>
<th>Predictive factors</th>
<th>B</th>
<th>P</th>
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<tr>
<td>improvement at T1</td>
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<td>Neurophysiologic class (T0)</td>
<td>neurophysiologic class (T0)</td>
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</tr>
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<td>beginning of symptoms #</td>
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<td>0.04</td>
</tr>
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</table>

# Beginning of symptoms during pregnancy (month).
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References

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