Assessment of Work-Related Risks Factors for Carpal Tunnel Syndrome

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Abstract

Background: The association of carpal tunnel syndrome with occupational risk factors is well established. However, in clinical practice these factors are only rarely considered and evaluated. Managing these risk factors could prevent the occurrence of future cases and alleviate treatment of the afflicted individuals.

Objectives: To estimate the role of occupational risk factors in a large group of patients diagnosed by electrophysiological studies as suffering from CTS.

Methods: A group of 396 subjects (204 women, 165 men) who were tested in one laboratory by electrophysiological studies were further evaluated (by questionnaire) to determine the possible role of occupational and other risk factors in the etiology of their syndrome.

Results: Persons employed in high force – low repetitive or low force – high repetitive jobs, harbor an extra risk for developing CTS as compared with controls, OR = 3.21 (95% C1 = 1.5-6.9) and OR = 4.72 (95%C1 = 1.8-12.5), respectively. These jobs include typists/secretaries, nursing personnel, production workers and housewives.

Conclusion: Evaluation of a general group of examinees referred for electrophysiological studies on sympatology compatible with CTS may show that occupational risk factors play a substantial role in the development of symptoms. By increasing the awareness of clinicians and the public to these risk factors, appropriate preventive measures can be introduced and the burden of the disease reduced.

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Carpal tunnel syndrome is a well-described clinical entity, usually presented with typical symptomatology and electrophysiological manifestations. These manifestations result from entrapment of the median nerve at the wrist (carpal tunnel). As a rule, the syndrome is more common in women and is associated with several recognized risk factors. Occupational risk factors, which were found to be associated with a higher occurrence rate of CTS, include job tasks with highly repetitive movements of the fingers and/or the wrists [1–6], utilization of vibrating tools [5,6], use of continuous force [3], or certain occupations such as housewives [7], musicians, meat and fish handlers [8], or jobs requiring extreme flexion of the wrist [9]. Of the non-occupational risk factors, the major ones are: gender, age, dominant hand, and certain predisposing diseases and conditions such as pregnancy, obesity, amyloidosis, myxedema and diabetes mellitus [5,10,11].

Despite the relatively easy way by which this syndrome can be diagnosed and its well-known association with certain work-related factors, in many cases this association is not made by the attending clinicians [12]. This is quite unfortunate because by establishing the relationship between specific occupational risk factors and the occurrence of CTS in the afflicted worker, the necessary preventive actions could be taken to prevent further damage and development of similar injuries in fellow workers.

Electrophysiological testing for ascertaining CTS is performed when the clinical symptoms are not typical, when there is a doubt about the exact diagnosis, to assist in differential diagnosis that may exist, or in order to document the diagnosis prior to surgical intervention. Electrophysiological ascertainment of CTS is based on demonstrating slowing of conduction velocity (both sensor and motor) of the median nerve. Several electrophysiological parameters are used to specify the entrapment damage to the median nerve: a) distal motor latency, b) decrease in the sensory conduction (velocity and amplitude), and c) increased difference in the motor latency between the radial and median nerve of the same arm.

Materials and Methods

We studied a group of 396 subjects (204 women, 165 men) who underwent electrophysiological tests in one laboratory during a 6 month period in 1995. The laboratory is part of a large diagnostic center to which examinees from the whole country are referred for evaluation [13]. Each participant signed an informed consent to be included in the study and completed a questionnaire concerning demographic data and occupational and medical history. This study group was divided into two groups:

- Cases, comprising examinees with a positive test for CTS (as defined by the set of electrophysiological data).
- Controls, group A – consisting of those examinees who

CTS = carpal tunnel syndrome

tested negative for possible CTS, and group B – all those examinees who underwent electrophysiological evaluations of the limbs because of other symptomatology, not suspected for CTS.

The criteria for a positive electrophysiological test for CTS (cases) were: sensory latency longer than 3.9 msec, and/or motor latency longer than 4.5 msec. The detailed questionnaire provided the means for characterizing job tasks to ascertain co-morbidity, symptomatology and other relevant risk factors.

Categorizing examinees to occupational groups was done according to the criteria and questionnaire of Silverstein et al. [3]. These included:

- Low force – high repetitive jobs (LF-HR) – those occupations in which force is usually not used but require many repetitive movements of the wrists and/or the fingers.
- High force – low repetitive jobs (HF-LR) – where the job tasks demand use of substantial force but with no repetitive movements of the wrists or fingers.
- High force – high repetitive jobs (HF-HR) – where both marked force and frequent repetitions of movements are required in order to comply with the job demands.
- Others – occupations/jobs that could not be classified according to the previous categories (such as housewives).

Results

Table 1 presents the frequency distribution of the study group by gender and by job category. None of the subjects could be classified into the HF-HR category. While in the LF-LR category the relative frequency of both sexes is quite similar, in the HF-LR the relative frequency of men is three times that of women. The high relative frequency of women in the "other" category is mainly due to the large number of housewives.

The male/female ratios were similar in all three study groups. The mean age of the examinees was 46.4 ± 10.4 years, with no significant difference between men and women. No differences were found among the study groups when compared by indices such as country of origin, education, or smoking habits.

Table 2 shows the distribution of the cases and controls by gender and job category. Over 50% (188/369) of the examinees were employed in LF-LR jobs. In this category, the rate of diagnosis of CTS in persons with symptoms was about 45% for both men and women. However, for individuals with CTS symptomatology who worked in job tasks with LF-HR or HF-LR characteristics, the rates of positive electrophysiological test results were obtained in over 50% (25/46 and 34/65, respectively) of both men and women. For men employed in HF-LR jobs, the rate of positive tests reached 64% (28/44), indicating that such tasks carry a stronger correlation between job tasks and symptomatology.

Multiple logistic regression analyses (with the category LF-LR serving as the reference group) demonstrated statistically significant odd ratios for certain job categories as a risk for developing CTS [Table 3]. Significant ORs were found for men with HF-LR tasks and for women with LF-HR tasks. When calculating the ORs for men and women combined, the ORs for both categories were found to be statistically significant.

Table 1. Frequency distribution of subjects by gender and job categories

Job category	Men	Women	Total
LF-LR	90	98	188
	(54)	(48)	(51)
LF-HR	12	40	52
	(7)	(20)	(14)
HF-LR	55	22	77
	(38)	(11)	(21)
Other	8	44	52
	(5)	(22)	(14)
Total	165	204	369
	(100)	(100)	(100)

* There were no subjects in the HF-HR category.
Numbers in parentheses are percentages of the same column.

Discussion

Persons employed in HF-LR tasks or LF-HR jobs harbor extra risk for developing CTS as compared to control groups, OR = 3.21 (1.5, 6.9) and OR = 4.72 (1.8, 12.5), respectively.

Many earlier studies have demonstrated that similar occupations carry extra risks of developing cumulative trauma

Table 2. Frequency distribution of cases and control groups by sex and job categories

	Men			Women			Total			
		Controls			Controls			Controls		
Job category	Cases	A	B	Cases	A	B	Cases	A	B	TOTAL
LF-LR	21	46	23	24	46	28	45	92	51	188
	(37)	(66)	(60)	(36)	(49)	(64)	(37)	(56)	(62)	(51)
LF-HR	6	3	3	19	18	3	25	21	6	52
	(11)	(4)	(8)	(29)	(19)	(7)	(20)	(13)	(7)	(14)
HF-LR	28	16	11	6	15	1	34	31	12	77
	(49)	(23)	(29)	(9)	(16)	(2)	(28)	(19)	(15)	(21)
Other	2	5	1	17	15	12	19	20	13	52
	(3)	(7)	(3)	(26)	(16)	(27)	(15)	(12)	(16)	(14)
Total	57	70	38	66	94	44	123	164	82	369
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Numbers in parentheses are percentages of the same column.

OR = odds ratio

Table 3. Multiple logistic regression analysis of job categories (as risk factors for developing CTS*) for men and women separately and combined (controlling for age, ethnic origin, level of education, obesity and smoking habits)

	Job category			
	LF-HR	LF-LR	HF-LR	LF-LR
Men				
Cases	6	21	28	21
Control B	3	23	11	23
OR (95%CI)	2.2 (0.5,9.9)		2.8 (1.1,6.9)	
Significance	NS		0.05	
Women				
Cases	19	24	6	24
Control B	3	28	1	28
OR (95%CI)	7.4 (1.9,28)		7.0 (0.8,6.2)	
Significance	0.05		NS	
Total				
Cases	25	45	34	45
Control B	1	28	12	51
OR (95%CI)	4.72 (1.8,12.5)		3.21 (1.5,6.9)	
Significance	0.05		0.05	

* CTS as diagnosed by electrophysiological studies.

** Similar analyses comparing cases to the control A group gave very close ORs, except that for women, the comparison of LF-HR did not give a significant OR.

disorders of the upper extremities [1–5]. Despite this fact, we could ascertain that only in about 10% of the cases in this study was an occupational physician involved in managing the patients, and only rarely did the involved clinician ask the patients about their occupation and specific tasks in their work. This lack of awareness is regrettable since much of the burden of these syndromes could be prevented, as many of the concerned risk factors are amenable to modification [2,14]. It should be pointed out that a non-negligible proportion of subjects had to quit or change their jobs because of the severity of their symptoms or disability. Such sequelae have substantial economic implications for both employees and employers [16,17].

Compression of the median nerve at the wrist currently affects an increasing number of workers in modern working sites [15,18]. The burden of this clinical entity could be reduced by changing work practices in these industries or jobs, and by early detection and intervention. Since much of this burden is preventable, it is essential that all clinicians involved with evaluating and treating patients with symptomatology of CTS be alert to possible occupational risk factors.

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There is one thing certain, namely, that we can have nothing certain; therefore it is not certain that we can have nothing certain.

Samuel Butler, 1912