Correlation between Duration of Work and Hand Position Using Computer with Carpal Tunnel Syndrome(CTS) at the Registration Administration Officer in Dr. Soetomo General Hospital Surabaya

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Abstract

Background: Carpal tunnel syndrome (CTS) is commonly reported among professional computer users. Repetitive work is a widely known risk factor for occupational CTS. Administrative staff for patient registration is one of the jobs in Dr. Soetomo General Hospital that deals with repetitive data entry work in terms of long-term use of computers.

Objective: This study aims to determine the relationship between length of work and hand position of computer use with the incidence of carpal tunnel syndrome in administrative registration staff at Dr. Soetomo Hospital Surabaya.

Method: Clinical examination and nerve conduction study (NCS) observes 60 hands of 30 registration officers with computer users at Dr. RSUD Dr. Soetomo Surabaya that fulfills the inclusion and exclusion criteria from period of the October-December 2012.

Results: The average age of the study subjects was 37.80 + 10.841. The subjects of the study consisted of 54 women and 6 men. The average length of work in the year is 9.75 + 8.36. The average working hour / day is 6.02 + 1.367. The frequency of the most extension hand position with 68.3%, the incidence of 92.9% for the occurrence of CTS work duration> 3 years was significant with P = 0.005, RO 8,273 (95% CI 1,829-37,410). The incident rate is 89.6%, for the occurrence of CTS at staff with working years> 4000 hours, gets result of P = 0.021, RO 6.143 (95% CI 1.406-26,842). The incident of 87.8% for the occurrence of CTS with extended hand position, gets insignificant result with P = 0.263, RO 2.571 (95% CI 0.644-10.270).

Conclusion: There was a significant relationship between length of work and the incidence of CTS and there was no relationship between extension hand position and incidence of CTS.

Keywords: *Duration of Work, Hand Position, CTS Occurrence.*

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Introduction

Computers are used in offices around the world, for the last few decades there has been a rapid increase in computer-related work demands. Several studies have reported a positive relationship between computer use and musculoskeletal symptoms[(1)]. CTS is commonly reported among professional computer users among musculoskeletal disorders. Repetitive work on the hands causes a variety of changes to the carpal tunnel that could

cause the CTS. Repetitive was a widely recognized risk factor for occupational CTS due to the increased pressure on the carpal tunnel The cause of trauma was a hand movement that has been identified as a disturbing factor for CTS occurrence especially in people who work repetitively requiring strength of the fingers and flexion-extension of the wrist.

The compression of the median nerve in the wrist was the most common compression neuropathy and, consequently, was one of the most common reasons for electro diagnostic examination. Almost all patients have compression sites that usually occur in the carpal tunnel resulting in a set of symptoms and signs called carpal tunnel syndrome

Soetomo General Hospital Surabaya is a type A referral hospital for Eastern Indonesia that uses computerization in its service administration. The patient registration administration officer is one of the jobs in Soetomo General Hospital which is related to repetitive data entry job in long term computer usage[2].

Therefore, the researcher wanted to know the correlation between the duration of work and hand position of computer usage with the incident carpal tunnel syndrome (CTS) which evaluated by electro diagnostic nerve conduction study (NCS) on median wrist nerve in the form of distal latency and Δ SNAP at the registration administration officer in Soetomo General Hospital who uses the computer in its activity.

Method

This study was an observational analytic study that aims to find the correlation between the duration of work and the hand position using a computer with the incidence of carpal tunnel syndrome (CTS) at the registration administration officers in Soetomo General Hospital Surabaya. The cross sectional study was used in this study because it was considered in accordance with the purpose of research which was to know the correlation between two variables at one time. In addition, this design was relatively easy, fast, and rarely threatened to drop out. Consecutive sampling was used as a method of selecting samples because this method was the best of non-probability sampling and easy to do[3].

This study used cross sectional study because it was considered in accordance with the problems studied and the objectives to be achieved. The sampling of the research was conducted in the Section of Registration of Patients and Neurology Policlinic at Soetomo General Hospital, while the NCS recording was done in EMG Room of Soetomo General Hospital Surabaya[4].

Population and Sample: Population in this research was administration officer of patient registration using computer in Soetomo General Hospital. While the samples were the administrative officers of patient registration using both mouse and keyboard computers that fulfilled inclusion-exclusion criteria. The inclusion criteria were the registration administration officers in Soetomo General Hospital using computer in their duties, aged 18 - 56 years, has worked for a minimum of 6 months, and was willing to follow the research. While the exclusion criteria as follows officers who have experienced trauma (carpal or radius fracture), neoplasms, and arthritis; and officers with CTS but did not want to do the NCV screening.

Moreover, the sampling from consecutive admissions was used until the number of samples has been determined. Preliminary research was conducted to determine the sample size. Based on the calculation obtained the required sample size was 12 of each proportion. Then, the total samples obtained were 60 officers in this study.Later on, the results of the preliminary research obtained the required sample size of each proportion was 12 along with the total sample that obtained during this study was 60 consisting of 6 men (10%) and 54 women (90%). That happened because this research was a cross sectional studies which recording and measuring variables at one time simultaneously[5].

The sampling of the research was conducted in the Section of Registration of Patients and Neurology Policlinic at Soetomo General Hospital, while the NCS recording was done in EMG Room of Soetomo General Hospital Surabaya from October to December 2012.

Research Variables: The independent variables in this research were the duration of work and hand position of computer usage at the administrative officers of patient registration in Dr. Soetomo General Surabaya. While the dependent variables was the incidence of CTS based on the NCS value of the median nerve wrist by the antidromic examination of the IV finge[6].

The operational definition for the variable of the patient registration administration officer was the officer whose daily activities related to the administration of the

patient using computer in both the mouse and keyboard at least in the last 6 months. The duration of work was a routine activity related to the use of computers. The position of the hand was a habit of hand position when the working using a computer[7]. Flexions and neutrals were the position between the forearm and hand in straight position with no flexion/extension on the wrist. CTS was an entrapment neuropathy by the median nerve compression that were diagnosed with anamnesis (pain or thickness on the anterior surface of the thumb, index finger, middle finger and half radial of ring finger a few weeks earlier), physical examination (positive sign of Tinel or Phalen) and was proved by using nerve conduction study[8].

Table 1. The Nerve Conduction Study (NCS) assessment of the median wrist nerves

	Normal (msec)	Mild (msec)	Moderate (msec)	Severe (msec)
DL CMAP	< 4	4	4-6	>6
Δ SNAP the median-ulnar nerves	< 0,4	0,4	0,4-2	>2

Table 1 shows that the Nerve Conduction Study (NCS) assessment of the median wrist nerves using IV finger antidromic examination and normal assessment of CTS (mild, moderate, severe)

Data Collection: Prior to the data collection, all subjects which included in the inclusion criteria were briefed on the purpose, usefulness, and risk of the research, then asked to follow the study without coercion. At the end of the explanation, the subjects were asked to read the research descriptions. If the subjects have been understood, they were asked to sign the statement of consent to participate in research. However, if there were things that have not been understood or less clear then it could be asked back to the doctor who gave an explanation[2].

The subjects who have signed a letter of approval will be recorded in the form of identity and characteristics. The data were collected by the author and other resident doctors with the following steps; conducting anamnesis, physical and neurology examination, selecting the samples for the experimental group according to the inclusion and the exclusion criteria, data collection, nerve conduction study (NCS) examination, and lastly, all results were collected for the data tabulation and the statistical analysis. The correlation between working duration and hand position with CTS incidents assessed with NCS median nerve wrist was analyzed by fisher test because it did not meet the requirements of chi square test[9].

Result

Table 2. Fisher Test Analysis between the Work Duration with the Incidence of CTS

		CTS Incident				P
		Normal		CTS		
		N	%	N	%	
Work Duration	< 3 years	7	38,9	11	61,1	0,005
	>3 years	3	7,1	39	92,9	

Additionally, 11 subjects with a working duration <3 years experienced CTS (61.1%) whereas CTS incidence in long-term officers >3 years was found in 39 subjects (92.9%). The correlation between the working duration and the CTS incidence was analyzed by Fisher test that resulted in a significant difference with P = 0,005 (significance Fisher) and odd ratio of 8,273 (95% CI 1,829-37,410).The duration of work was calculated based on the working duration in year multiplied by the mean of working duration each subject in hours for each day was (276 effective working days in a year).

Table 3. Fisher Test Analysis between the Work Duration in the Year/Hours with the Incidence of CTS

		CTS Incidents				P
		Normal		CTS		
		N	%	n	%	
Work Duration	< 3000 hours	4	40,0	6	60,0	0,052
	>3000 hours	6	12,0	44	88,0	
Work Duration	< 4000 hours	5	41,7	7	58,3	0,021
	>4000 hours	5	10,4	43	89,6	

Tabel 4 shows that CTS incidence was experienced by 6 subjects with duration <3000 hours (60%) and 44 subjects with duration >3000 hours (88%). The correlation between the working duration in year/hours and the CTS incidence was analyzed by Fisher test that resulted in no significant difference with P=0,052 (significance valueFisher) and odd ratio of 4,889 (CI 95% 1,063-22,484). CTS incidence was experienced by 7 subjects with duration of <4000 hours (60%) and 43 subjects with duration >4000 hours (88%). The data analysis of the correlation between the working duration in year/hours and the CTS incidence was a significant difference with P=0,021 (significance valueFisher) and odd ratio 6,143 (CI 95% 1,406-26,842).

Table 4. Fisher Test Analysis between Hand Position with CTS Incidents

		CTS Incidents				P
		Normal		CTS		
		N	%	N	%	
Hand Position	Normal	5	26,3	14	73,7	0,263
	Extension	5	12,2	36	87,8	
Total		**10**	**16,7**	**50**	**83,3**	

Table 5 shows that 14 subjects experienced CTS incidence in normal hand position (73.7%) and 36 subjects with extension hand position experienced CTS incidence (87.8%). Fisher test was performed to see the correlation between the hand position and the CTS incidence which resulted in no significant difference with P = 0,263 (Fisher significance value) and odds ratio 2,571 (95% CI 0,644-10,270).

Discussion

The data above shows that women have higher risk to get the symptom because it was likely due to the use of intensive and repetitive hand in doing housework, typing and other work traditionally that done mostly by women[10]. This might be part of the explanation of why the prevalence of CTS in women was way greater than in men[11].Moreover in this study, both working duration in years and in year/hours associated with the computers usage have the risk factors for CTS events after examination with a nerve conduction study (NCS). This was consistent with a study by Ali KM who found that working with computers was 2.4 times more likely to have CTS (95% CI 1.4-3.8). The administrative activity was a repetitive activity with stress and mechanical stress, constantly typing and using the mouse, compared to other computer users[12].

The extension hand position risk for CTS incidence in this study was not statistically significant, but the proportion in this group (87.8%) was higher than the normal position (73.7%). These results were consistent with the results of Ali KM's study which have a higher risk for CTS but did not statistically significant. The position of the extension hands while working using the computer causes the carpal tunnel to narrow compared to the neutral position (13)This requires ergonomic attention. Keeping hands neutral while working with a

computer could be facilitated by using adjustable seats and the proper positioning of the keyboard and mouse. Creating awareness among computer professionals to kept the hands in a neutral position was also important[11].

The results of this study implied that CTS was an important musculoskeletal problem in administration officers who use computers. CTS have been reported to be a painful condition with numbness and tingling in the hands and an important cause of an occupational disability[14]. Therefore, it was important to make an early diagnosis of CTS in administration officers who use the computers based on clinical symptoms and examinations to prevented the development of working disability. It was also important to study the relationship of further risk factors, as well as the implement ergonomic rules to relieve suffering and pain[15].

However, this study still has limitations, firstly, the predominant population was female. Based on a comparison study of CTS between men and women, it was not clear whether the results of this study could be generalized to the male population. Secondly, electro diagnostic standard was used in this study to diagnose CTS. Then, Thirdly, the positioning of the hands did not use a detailed angle.

Conclusion

There was a correlation between the working duration both in years and in year/hours with CTS incidences based on NCS median nerve results. Also, therewasno correlation between extension hand position when using computer with CTS occurrences based on NCS median nerve wrist results at registration administration officers in Soetomo General Hospital Surabaya.

Ethical Clearance: The research process involves participants in the survey using a questionnaire that was accordant with the ethical research principle based on the regulation of research ethic committee. The present study was carried out in accordance with the research principles. This study implemented the basic principle ethics of respect, beneficence, non-maleficence, and justice.

Conflict of Interest: There is no report of conflict of interest so far and this paper is 100% original and never been published before elsewhere.

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