

CARPAL TUNNEL AND THE LACK OF INFORMATION BY THE USER

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Resumen: Actualmente la industria maquiladora busca producir a menor costo, tiempo y mayor escala, y no observan el factor humano; esto se ve reflejado en la decadencia del nivel de vida del trabajador. La mano es una de las regiones más expuestas en la actividad laboral, y ésta desarrolla tareas relacionadas con esfuerzos manuales intensos y movimientos repetitivos. Los objetivos de este estudio fueron: Demostrar que en el entorno laboral administrativo de la Ciudad de Chihuahua se presentan los síntomas del STC, identificar las prácticas inadecuadas por las cuales se tiene este tipo de incidencia, exponer el daño físico y generar información para futuros estudios. El estudio se realizó con personal de nivel licenciatura. La investigación consistió en aplicar una encuesta a personal que labora en la industria del sector Salud, Aeroespacial, Automotriz, Electrónica y Eléctrica de la Cd. de Chihuahua. Con un tamaño de muestra de 50 personas, se obtuvieron dos categorías: personal de Área de Diseño y personal Administrativo en General, esto por el número de horas al día que utilizan la computadora. El estudio arrojó los siguientes resultados: 63% de ambas categorías desconocen el tema. El 94% aceptaron sentir o haber sentido algún síntoma. Los síntomas que presentaron una mayor periodicidad en los sujetos de ambas categorías fueron: Entumecimiento u Hormigueo en la mano con 49% y dolor de la muñeca 27%. La gran mayoría no conoce la forma adecuada de manejar el ratón de la computadora ni cuentan con el apropiado. 83% aceptaron no usar algún accesorio para evitar la fatiga de la mano. El instrumento utilizado para el estudio fue el Método Sue Rodgers, se obtuvo la combinación 343, esto es: se tienen niveles de esfuerzo fuertes (3), la duración del esfuerzo es superior a 15 minutos, entonces se asigna muy Alta prioridad (4) y la frecuencia de esfuerzos por minuto es elevada, esto es el número de click's que se le dan al mouse durante el día (3).

De lo anterior se concluye, que la mayor parte de las personas desconocen la enfermedad como tampoco saben si la padecen, porque la mayoría de las veces solo han sentido molestia y no le han dado importancia. Las áreas de trabajo no son ergonómicas y los empleados se adaptan a las mismas; en lugar de ser lo contrario.

Abstract: Nowadays factory industries look forward to produce less cost, time consuming and higher scales, and they don't see the real picture; this is shown or reflected with the declined of the worker life level. The hand is one of the region's most exposed in the labor activity, and this develops tasks related to intensive manual labor and repetitive movements. The objectives of this investigation were: to demonstrate in the administrative environment from the city of Chihuahua the following symptoms manifest the carpal tunnel syndrome, to identify inadequate practices for which we have the following symptoms, to explain physical

damages and to generate information for future studies. The investigation was done by personal with a degree. The application consisted of applying a survey to employees of the company Health sector, Aerospace, Automotive, Electronics and Electric of the city of Chihuahua. With a sample size of 50 persons, two categories were personally obtained: from the area of design and general personal administrative, this is for the amount of hours that the computer is use. The investigation shows: 63% of the people are not familiar with the topic. 94% have accepted felt or had felt some symptoms. The symptoms that represent more regularity on the people are: numbness or creeps in the hand with 94% and pain in the wrist 27%. The great majority does not know the form adapted handling the mouse of computer nor having the appropriate one. 83% of the people don't use any accessories to avoid fatigue on the wrist. Applying Sue Rodger's method, we obtained the grouping 343, this is: we have levels of hard effort (3), continuous effort duration is over 15 minute, therefore it is assigned to a very high priority (4) and the frequency effort by minute is elevated, this is the numbers of clicks when we use the mouse during the day (3).

It is confirmed that the great majority does not know the sickness and neither knows if they have it, because they have only felt annoyances and they haven't priorities the sickness. The work areas aren't ergonomics and the employees adapt to the same environment; instead of doing the opposite.

1. INTRODUCTION

The carpal tunnel is a narrow tunnel in the wrist form by ligaments and bones. The median nerve which carries impulses from the brain to the hand, passes through the carpal tunnel along with the tendons that allow the hand to be closed. When the tendons are strain, they swell inside the tunnel and compress the median nerve. Carpal tunnel syndrome (CTS) is a condition that can be caused by doing repeated tensioning movements with the hand or by having the hand in the same position for long periods. This syndrome has been known for a long time. Meat packers started to complain about pain and the lost of function in the hand in the year 1860. Back then, these complaints were attributed in greater part to bad circulation. But the nature of work has changed through the years. (Montoro, 2006) Carpal tunnel syndrome is a relatively common pathology. It's more frequent in women between the ages of 30-60. It's characterized by tingling and pain in the second and third finger. (CCOTT, 2005)

Nowadays, many jobs are highly specialized and require the repetitive use of the hands. With the increase in the number of people who use computers, keyboards, and computer mouse, CTS is a concern or real threat for all the people who are subject to repetitive work without taking any breaks by determined prolonged labor effort.

All these excesses or complications in the work are due in a large extent to the lack of programming in production and therefore appear the so called emergencies of the clients and consequently attention to the human factor is not lent and this gives rise to upsets of repetitive movements such as bursitis, tendonitis, writer's cramp, CTS, etc.

Numerous articles related to CTS have been written, but in this occasion it will be known the lack of attention in the ergonomic aspect on the part of the employer-employee as well as the little diffusion of the subject that is counted among the population of several companies in the State of Chihuahua.

2. OBJECTIVES

1. To demonstrate that in the administrative labor environment in the City of Chihuahua the symptoms of CTS appear in the same way as in other regions and countries of the world.
2. To identify the inadequate behaviors or practices by which this type of incidence is had, this with the purpose of exposing how it can be avoided.
3. To expose the physical damage, as a result of the discomfort derived by bad posture.
4. To generate data for the decision making with respect to other diseases even of the professional type.
5. To generate information for future study.
6. To avoid or prevent the incidence of CTS.
7. To make awareness of the good use of the computer mouse and to outline the necessary actions to apply the changes in the habits.

3. DELIMITATIONS

It is not possible to compare among the operative personnel in the present investigation since the study was conducted among personnel with a college degree. Furthermore, the results are not generalizable in PyME'S since the study was conducted in the private industry and in some federal government offices.

4. DEVELOPMENT

CTS is a quiet disease, if we don't have some knowledge about the subject we will only let the symptoms pass as simple passing pains without taking into account its respective precautions to avoid future complications. With this the investigation was focused to make an analysis in the companies and especially in the people who work in them and that in addition pass great part of their day in front of a computer.

4.1 Historical Antecedents

In 1854, Sir James Paget describes for the first time the sintomatology of the compression of the carpal tunnel due to traumatism on the wrist. Marie and Foix, in 1913, describe the compression of the median nerve in a necropsy. The term "carpal tunnel syndrome" was coined by Moersch in 1938 and the clinical symptoms are correlated with the anatomopathological ones, until that moment it was believed that the sintomatology presented by the patients affected by CTS was caused by a cervical rib. Learmonth performs the first decompression of the carpal tunnel in a symptomatic patient, but it is not until 1947 when the first results of the surgical treatment were published. Phalan, in 1951, makes studies in which he includes more than 1,200 hands; being him the true introducer of said pathology in the surgery of the hand in modern medicine. In 1966 a transcendental step took place, when George Phalen published his series with more than 650 cases and made an ample description of the disease, its diagnosis and treatment by surgical methods. However, it has not been until a couple of decades when there has been more advancement in the

knowledge of this disease, possibly by its increasing incidence and its economic repercussion. (Ojeda, 2001 and Aran, 2003)

4.2 What is CTS?

The carpal tunnel is formed behind and the sides by the bones of the wrist, and in front by the transverse ligament of the carpal. The median nerve passes through this space and its pinning in the tunnel produces typical neurological manifestations (see figure 1). The median nerve controls the sensations of the back part of the fingers (except the little finger), as well as the impulses of some small muscles in the hand that allow the fingers and the thumb to move. The carpal tunnel is a narrow and rigid passage of the ligament and the bones in the base of the hand-it contains the median nerve and sinews. Sometimes, the thickening of the irritated sinews or other swellings narrows the tunnel and cause that the median nerve be compressed. The result can be pain, weakness or numbness of the hand and the wrist, spreading through the entire arm. Among the many causes of this syndrome are traumatismos, the fibrous sclerosis of the sheaths tendons and rheumatism. (Harrison, 1973)



Figure 1. STC (University of Virginia, 2007)

4.3 Causes

These can occur by: fluid level variations (sugar in the blood in diabetics), muscular alterations, diseases of the joints or bones, hormonal changes, bad ergonomic positions (bad posture), previous injuries like fractures, some repetitive hand work, and genetic inheritance. (Aguirre-Cavazos, 2007)

One of the main causes in which we will do emphasis will be in the ones that are produced by bad posture and the one that is observed commonly among the employees who carry out tasks and/or works that require repetition of a same movement of the hands or fingers during prolonged periods. Figure 2 shows a clear example of the bad posture with the computer mouse, keyboard, monitor, and desk and in some operations. (Melo 2005)



Figure 2. Wrong Ergonomics' Position

4.4 Sintomatology

There is pain and burning sensation of the four fingers, almost always bilateral, that worsen during the night. Some of the most frequent symptoms could be: tingling in the fingers, numbness of the fingers, pain in the thumb, burning sensation from the wrist to the fingers, Changes in the touch or sensitivity to temperature, clumsiness of the hands., weakness to take hold, ability to puncture, and other actions with the fingers, swelling of the hand and the forearm, Changes in the pattern of sweat of the hands. (Montoro, 2006 and Harrison, 1973)

4.5 Statistical Information

The hand is one of the most exposed regions in labor activity; according to statistics from the Instituto Mexicano del Seguro Social, in the year 2006, 309.539 workers suffered Industrial accidents according to Anatomical Region and age group and 31,8% were hand and wrist injuries (including wounds, traumatisms and fractures); furthermore if one reviews the Industrial accident according to Anatomical region and type of injury we can see that out of the total of workers at a national level, the 31,9% are represented by injuries in the wrist and hand. (IMSS, 2006)

Another important data is that CTS has an incidence of 99:100 000 person-year, and its prevalence is 3, 4% in women and 0, 6% in men; it has the highest average of labor absence when it is compared with other pathologies related to the work. (Aguirre-Cavazos, 2007) These data is very useful to give account of the enormous problem that this type of injury constitutes.

In Mexico, the injuries by industrial accident by anatomical region hand-wrist represent an important part of the consultations and an economic loss as much for the employer as for the employee; this is caused by absenteeism. Statistically this represents in the State of Chihuahua a 0.45% in relation with the rest of the country. In 2006 Chihuahua presented incapacities by diseases cause by work in a 2.75% at a national level. (IMSS, 2006) The incidence of the referred disease cannot be specified statistically, since the table of diseases of the Federal Law of Work dates from 1930 and it has not been modified. This data only gives us an idea of the problem, but these sufferings are not a recognized reason for incapacity, since problems that are generated by stress, depression among others, bring about other types of general diseases by which the incapacity must be extended, but not like work risk. But this will not continue to occur when the laws are modified and the government takes into account "new diseases" produced by the excess of labor days. According to the news agency NOTIMEX, which says that the interinstitutional committee, from the Research center in Work of the IMSS, integrated by experts in the subject elaborated the proposal of new diseases and risks of work which they give to legislators of the House of Representatives, this list includes other diseases like cancers, stress, burn out syndrome among other 63 sufferings. (NOTIMEX, 2008)

4.6 Federal Law of Work

According to the Federal Law of Work, Title Ninth refers to the Risks of Work; article 513 mentions the table of work diseases, but they were only found to be like affections derived from industrial fatigue: Bursitis (141), Tenosynovitis (159) and Cramps (157), in all the cases

the only people taken into account are: telegraphers, radio operators, violinists, pianists, typists, writers, secretaries, handling of calculators, laborers, bricklayers, shovelers, adjusters, machinists, miners, shippers, sanders, dock workers, etc. [9]. We can give account that no modifications have been made to the law in this matter for three decades, and labor days tend to be of greater intensity and the cases of muscles and skeleton upset have increased for those of who are put under repetitive labors. CTS is not valued like a disease produced by the execution of repeated movements, therefore the employer does not take the bother to present or to provide the necessary information of the disease, does not change the ergonomics of the place nor rehabilitates or pays the medical expenses of the eventuality.

4.7 Sue Rodgers Method

There exist diverse techniques of job position evaluation, each of them are applicable under a series of conditioners, for example Rogers Muscle Fatigue Analysis, known as Sue Rodgers Method. The analysis of muscular fatigue was proposed by Sue Rodgers as a mean to evaluate the amount of fatigue accumulated in the muscles during several working patterns within 5 minutes of the same. The hypothesis is that a fast muscular fatigue is more susceptible to injuries and inflammation. This method for the analysis of work is more appropriate to evaluate the risk by fatigue (accumulation) in tasks that are carried out in one hour or more and where bad posture is present. The Sue Rodgers method of analysis studies the effort, the duration and the frequency required by each part of the body to carry out a certain task. The interaction of the level of effort is evaluated, as well as the duration of the effort before relaxation (or before passing to a smaller level of effort), and so is the frequency of activation of the muscles per minute for each muscle group. From these parameters a prediction of the muscular fatigue is made.



Each one of the parameters: effort, duration and frequency are evaluated individually, in a scale from 1 to 3, for each part of the body. The Degree of Severity is determined from the combination of the values assigned to each parameter: effort-duration-frequency. (Rodríguez, 2003 and Rodgers, 2006)

5. METHODOLOGY

The investigation consisted on applying a survey to several people who work in the factory industry in the Health, Aerospace, Automotive, Electronic and Electrical sector in the city of Chihuahua. The study was conducted due to the fact that the symptoms have been presenting in some fellow workers of the factory industries. The poll was made to a total of 50 people, but from the total of the inquiry, it would be sufficient to select 44 in a simple random form, considering that it has been worked with a 95% confidence level, to commit a 5% of error and of that in our sample 8% did not meet the characteristics of the population; reason why it is possible to be said that our data is representative. Two categories were obtained: personnel of the Area of Design on one hand and General Administrative personnel on the other, this occurred by the number of hours per day that the computer is used. With the application of the survey to other work areas the lack of knowledge of the referred subject clearly reflected. The questions that were asked were in relation to the application of the ergonomics in the places of work and with emphasis in the good posture that the user must have in the use of the computer mouse as well as the correct positioning of the hand-wrist

and also to the previous knowledge of CST and the information that the employee must have in case any of the symptoms present. The survey had the following format:

ENCUESTA INFORMATIVA STC

1. Sexo _____
2. Edad _____
3. Departamento _____
4. Conoce el Síndrome del túnel del carpo. SI No
5. Conoce los Síntomas. SI No
6. Cuanto tiempo continuo al día usa la computadora SI No
 0-1 hrs 1-2hrs 2-4hrs 4-6hrs 6-8 mas
7. Ha sentido dolor en su mano, muñeca cuando usa la computadora. SI No
 Mas dolor de noche que de día
 Dolor cuando usa la mano o muñeca frecuentemente
 Dificultad para agarrar objetos.
 Debilidad en el pulgar.
8. Ha tenido alguno de estos síntomas:
 Entumecimiento u hormigueo en su mano y dedos
 Mas dolor de noche que de día
 Dolor cuando usa la mano o muñeca frecuentemente
 Dificultad para agarrar objetos.
 Debilidad en el pulgar.
9. Como sujeta el Mouse de su computadora

10. Que tipo de Mouse usa

11. A que distancia usa el Mouse del teclado
 En otra posición diferente a la mesa de trabajo
 Menos a 10 centímetros del teclado
 Mayor a 10 centímetros del teclado
12. Utiliza algún accesorio para evitar fatiga en el uso del Mouse. SI No

Format 2. Poll

The survey was tried to be applied to Departments of Security and Hygiene, but they did not accept to answer it. Only in one company, was mentioned that they have an "Ergonomic Commission", but this only applies for the operator level and the project in which they are only focusing at this moment is the implementation of anti-fatigue mats.

On the other hand, the analysis of the position of the hand-wrist-fingers with the Sue Rodgers method was also made, the format is the following (Rodgers, 2006):

Rodgers Muscle Fatigue Analysis: by Task

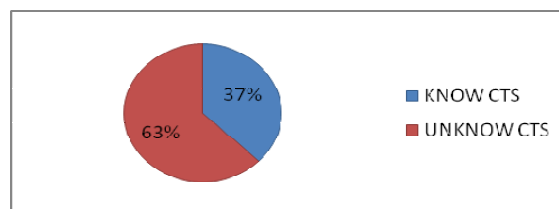
Task	Effort Level (If the effort cannot be exerted by most people, enter 4 for Effort and VH for Priority)			Scores			Priority
	Light -- 1	Moderate -- 2	Heavy -- 3	Effort	Dur	Freq	
Neck	Head turned partly to side, back or slightly forward.	Head turned to side, head fully back; head forward about 15°	Same as Moderate but with force or weight; head stretched forward.				
Shoulders	Arms slightly away from side; arms extended with some support.	Arms away from body; no support; working overhead.	Exerting force or holding weight with arms away from body or overhead.	Right			
Back	Leaning to side or bending working.	Bending forward; no load; lifting moderately heavy loads near body; working overhead.	Lifting or exerting force while working; high force or load while bending.				
Arms / Elbow	Arms away from body; no load; light force; lifting near body.	Exerting arms while exerting moderate force.	High force; exerted with motion; lifting with arms extended.	Right			
Wrists / Hands / Fingers	Light force or weights handled close to body; straps; comfortable power grips.	Large work time or narrow grip; moderate to light weight; especially flexion; use of gloves with moderate forces.	Pinch grips; strong wrist angles; slippery surfaces.	Right			
Legs / Knees	Standing, walking without bending or leaning; weight on both feet.	Leaning on table, weight on one side; pivoting while exerting force.	Exerting high force while pulling or lifting; crouching while exerting force.	Right			
Ankles / Feet / Toes	Standing, walking without bending or leaning; weight on both feet.	Bending forward; leaning on table; weight on one side; pivoting while exerting force.	Exerting high force while pulling or lifting; crouching while exerting force.	Right			
Continuous Effort Duration:	< 0 s 1	6 - 20 s 2	20 - 30 s 3				> 30 s 4 (Enter VH for Priority)
Effort Frequency	< 1 /min 1	1 - 2 /min 2	> 2 - 12 /min 3				> 12 /min 4 (Enter VH for Priority)

Format 3. Sue Rodgers Method

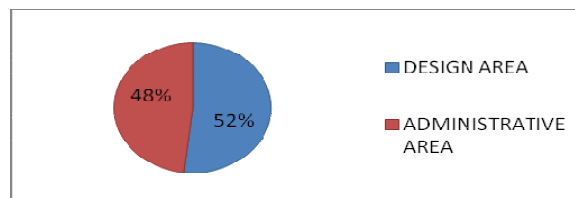
6. RESULTS

The results of the surveys made in the city of Chihuahua are presented next. For security reasons, the surveyed personnel asked not to disclose the name of the company where they work. As it was previously mentioned, altogether were 50 surveyed people pertaining to 8

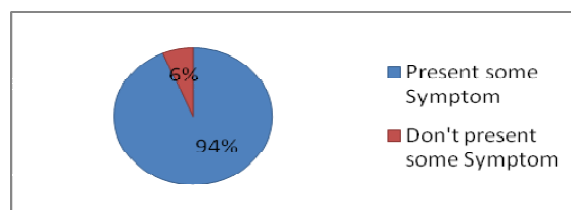
companies of the selected factory industries. When the questionnaire was being applied, the majority of the people did not know of the existence of CTS. The data of the study showed that 63% of the people do not know about the subject (Graphical 3.1). The appearance of the upset in the hand-wrist by work site was almost similar since 52% of the people who work in design presented the pain as well as 48% of the administrative area (Graphic 3.2). Other important data, we know that the majority of the people do not know the subject, nevertheless they present the majority of the symptoms that were mentioned in the survey, 94% accepted to feel or to have felt some indication of it (Graphic 3.3), but they left it as something fleeting and did not give importance to the matter. The symptoms that presented a greater regularity are: Numbness or tingling in the hand and fingers with a frequency of 49% and wrist pain 27% respectively. And as it was to be expected, the majority of the individuals do not know the correct form to use the computer mouse nor have a suitable one. As well as they do not use or have not been provided by the company with an accessory to eliminate or to avoid fatigue in the wrist, 83% accepted not to use it (Graphical 3.4).



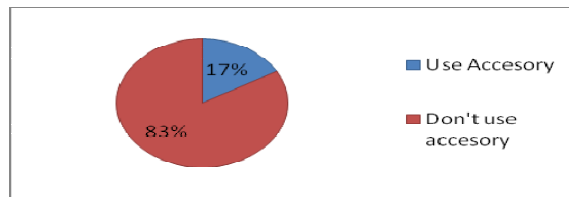
Graphical 3.1 General Knowledge



Graphical 3.2 Incidence of Pain by Work Area



Graphical 3.3 Presence of Symptoms



Graphical 3.4 Use accessory to avoid fatigue

On the other hand when doing the analysis with the Sue Rodgers Method the combination 343 was obtained, this means that strong levels of effort are had (3), the duration of the effort is higher to 15 minutes, so there is sufficient reason to assign a very High priority (4) and obviously the frequency of efforts per minute is elevated, this is the number of click's that are given to the computer mouse during the day (3).

Low (L)	Moderate (M)	High (H)	Very High (VH)
111	123	223	323
112	132	313	331
113	213	321	332
211	222	322	433, x43, xx4*
121	231		
212	232		
311	312		
122			
131			
221			

Format 4. Category turned out grouped by priority for the change in the Order of effort, effort continued Duration and Frequency. (Rodgers, 2006)

7. DISCUSSION

We can infer that most of the people do not know the disease as well as not knowing if they suffer it or not, because the majority of the times they have only felt annoyance and they have not given it any priority and they ignore the consequences in a not so distant future. The places or work areas are not ergonomic and the employees rather adapt to them; instead of doing the contrary. The only thing they know is that they must "produce and produce". We cannot blame everything on the companies, for the lack of information or not having suitable spaces to work harmoniously; since the laws do not force the employer to do it, since no sanctions or restrictions exist so that this is fulfilled. If only the government would worry to give priority to the risk factors of the physical type that provoke diseases that are not known as a result of work, our perspective would be totally different, but they only argue on saying that no disease has a unique cause. When one has begun to undergo some of the symptoms of this suffering the best course of action, before the disease worsens and must be put under surgery, is to carry out the following indications and/or recommendations: to immobilize the wrist by using a cast during the night, to use a wristband when using the computer mouse apart from resting the arms in such a way that they are not outside the desk and/or chair. This suffering can only be prevented if the companies had some type of previous education, for example, there exist several methods for evaluation of posture in the work place, that serves us to realize how badly designed the work zones are but these are not used, it is not known if it is because of the lack of knowledge or because they just choose to omit them.

They are easy to apply and they can optimize the tasks of labor risk prevention. But since CTS is a no recognized disease by labor laws; we can only know about the subject by means of communication like this one. This is the first part of a series of investigations that will be done and articles that will be written to spread the subject, to help create awareness in the companies about the prevention of the problem besides teaching and alerting the workers with latent risk to suffer CTS, due to the characteristics of their work.

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