



CARPEL TUNNEL SYNDROME: AN OCCUPATIONAL DISEASE

Anatomy

Dr. Juhi Sinha	PGT-1, MGMMC, Kishanganj, Bihar
Dr. B.C. Dutta	Professor, Anatomy Deptt., MGMMC, Kishanganj, Bihar
Dr. S.N. Jha	Associate Professor, Anatomy Deptt, MGMMC, Kishanganj, Bihar
Dr. Anupam Khalkho	HOD & Associate Professor, Anatomy Deptt., MGMMC, Kishanganj, Bihar
Dr. Sayantan Das	Associate Professor, Anatomy Deptt., MGMMC, Kishanganj, Bihar
Dr. Parijat Mukherjee	Assisstant Professor, Anatomy Deptt., MGMMC, Kishanganj, Bihar

ABSTRACT

Carpal tunnel syndrome (CTS) is a common problem in certain occupations. Many etiological factors have been suggested for CTS which include repetitive, prolonged hand and intensive activities, forceful exertions, awkward or static posture, vibration, temperature extremes and localised mechanical stress. The references were taken from Grays' anatomy and B.D.Chourasiya which we are supplemented by systematic searches on Google and Pubmed with keywords, occupation incidence, carpal tunnel syndrome, repetitive activities, several specific occupations including cutting metal, dealing with meat and fish processing, slaughter house, manufacturing and construction workers, musicians, repetitive industrial work groups, frozen, food factory employees, grocery store workers, footwear factory workers, etc. In summary, this study concludes that certain occupations involving wrist activities increases the risk of carpal tunnel syndrome. It is recommended that prolonged exposure to highly repetitive action of wrist (i.e. flexion and extension) movements should be avoided.

KEYWORDS

Occupation. Incidence. Carpal tunnel syndrome, Repetitive activities

INTRODUCTION

Carpal tunnel syndrome (CTS) is an entrapment syndrome caused by pressure on the median nerve within the carpal tunnel. This is usually chronic. CTS is one of the readily diagnosed compression neuropathies. CTS was ranked sixth among the recognised occupational diseases(1). In 2009, German Federal Ministry of Labour and Social Affairs published a scientific research paper by its medical expert advisory panel supporting the listing of CTS as an occupational disease(2).

Carpal tunnel syndrome is a common problem with estimated annual incidence rate of 0.5–5.1 per thousand. It's incidence in the workplace has reached epidemic proportions comprising 40.8% of the all upper extremity repetitive motion disorders. CTS was first discovered in 1947 that CTS was related to occupation when Brian et al(1947) reported approximately six cases of work related CTS in repetitive work. Occupational CTS is characterised by sensory and less commonly motor symptoms.

The etiology of this condition is often obscure, though in some instances the nerve injury may be a direct effect of increased pressure on the median caused by overuse, swelling of the tendons and tendon sheaths, (eg.- rheumatoid arthritis) and cysts arising from the carpal joints. Increased pressure in the carpal tunnel is thought to cause venous congestion that produces nerve edema and anoxic damage to the capillary endothelium of the median nerve itself.(3)

Symptoms And Diagnosis

The clinical symptoms of CTS include irritative symptoms such as nocturnal paresthesias, spontaneous pain, characterised by proximal radiation, "the shaking sign" (disappearance of the symptoms after vigorous, flapping of the hands), neural deficits and positive results of the standard provocative tests.

- 1.) Tinel sign:- triggered by percussion of the carpal tunnel. Patient complains pain resembling an electric sensation along with the course of median nerve right into the fingertips.
- 2.) Phalen test:- Paresthesias in the area supplied by the median nerve are caused by holding the hands against each other in the palmer flexion (parasthesias begin after 30s to 120s in this position).

One essential reproducible and objectifiable parameter is a pathological change in motor and sensory conduction velocity. CTS is

the commonest non-traumatic peripheral nerve lesion. Woman are affected 3 to 10 times more often than men and not infrequently that CTS is bilateral.

- Motor changes:- Ape like thumb deformity in which there is loss of opposition of thumb, index and middle fingers lag behind while making the fist due to paralysis of first and second lumbrical muscles and their partial clawing.
- Sensory changes:- Loss of sensation on lateral three and half digits including the nail bed and distal phalanges on dorsum of hand.
- Vasomotor motor changes:- The skin areas with sensory loss is warmer due to arteriolar dilation. It is also drier due to absence of sweating due to loss of sympathetic supply.
- Trophic changes:- Long-standing cases of paralysis lead to dry and scaly skin. The nails crack easily with atrophy of the pulp of fingers.

Epidemiology

Estimates of the prevalence and incidents of CTS depend critically on the adopted case definition, different choices generate markedly different estimates of prevalence.(4)

In large Dutch population survey that defined CTS as sensory disturbance in the median nerve distribution occurring at least twice a week generally awakening the patient from sleep, and associated with nerve conduction abnormalities, the point prevalence was 0.6% in men and 8% in women.(5)

In British population, survey estimates were made of sensory symptoms in various anatomical distributions.(6)

Classical CTS is defined as symptoms extensively affecting the palmer surfaces of the medial three digits and not felt elsewhere was reported by 1.2% of adults and probable CTS affected a further 2.2% of adults.

Estimates of prevalence and incidence depend upon the setting in which enquiries are made. The crude incidence rate is reported to be one per thousand person years in hospital diagnosed patients(7,8) and around two per thousand person years in primary care.(9) In selected working population, CTS is somewhat more common(1-2%), using clinical based criteria.

The age adjusted incidence rate of CTS may be increasing in the

general population(7,11) but exact comparisons between surveys are difficult as case definitions have changed over time following the introduction of electrophysiological testing.

Occupational Exposures

In some studies, analysis of work activities have been undertaken using panels of video cameras and with reflective spots or small lights fixed to workers' clothing, so that movements can be tracked, digitally encoded and analysed by computers.

In other studies, workers have worn electronic pendulum potentiometers and flexible, lightweight strain gauges, to enable computer reconstruction of postures and movements; static postures and joint angles have been mapped using photographs and goniometers; workload and muscle fatigue have been investigated using surface EMG and needle electrodes; and computer key strokes counted using dedicated software. This methods enable biomechanical measurements of force, posture, frequency and duration to be compared with known human capability.

Non-systematic errors in exposure assessment, tend to attenuate estimates of exposure – response, in the same fashion as errors of case classification. However, analyses that classifying expositors in broad categories, can you still demonstrate exposure- response effects as placing workers in rough rank, order and contrasting, the extremes of exposure is more feasible than assigning a correct numerical estimate of exposure.

High Risk Tasks And Occupations

A common feature to the high-risk tasks is the hand movements that are the reason to lead an increase in pressure on the median nerve. In assessing the probability of a casual link in an individual case, one needs to look at the actual task performed, not just the job title. Studies have demonstrated that combinations of work-related factors may result in a more than additive increase in risk for CTS. In particular, it can be assumed that working with hand – held vibrating tools involves strong gripping with the fingers flexors, and thus forced postures of the fingers and wrist, so that several components of exposure are present simultaneously.(8,9)

A recent review indicated, for example, that CTS may be attributed to work – related factors in people whose occupations involve average demands of more than 4kg on hand strength or repetitive tasks with cycle times less than 10 seconds, or similar repetitive tasks in more than half of the cycle periods.(10)

Case Management And Prevention

The management of work associated CTSS similar to that of non-occupational CTS, with the important exception of advice on control of casual or aggravating expositors. Recent updates report that disease can be controlled by significant short-term oral steroids, splinting, ultrasound, yoga and carpal bone mobilisation and local corticosteroid injections. Preventive measures may include

1. Job rotation.
2. Rest breaks
3. Task optimisation
4. Training
5. An induction period
6. A rehabilitation programme

RESULT

The evidence on Carpel tunnel syndrome and different occupations are considered under the following sub-headings

- Vibration exposed workers:- Strong evidence is shown in many researches that decreasing the acceleration level of a handheld vibrating tool has a positive relationship with the prevalence of HAVS (Hand Arm Vibration Syndrome).
- Assembly line workers:- With regard to assembly work, a greater than doubling of risk was reported by Abbas et al (2001) who studied personal and work related risk factors associated with the carpal tunnel syndrome in electronic assembly and clerical worker is in Egypt.
- Food processing, slaughter house and frozen food workers:- The prevalence of CTS in a meat and fish processing plant is much higher. The highest prevalence is considered in grinders, butchers, frozen food, factory workers, cleaners and sweepers.
- Computer workers:- These workers are mainly self-reported with complaints of tingling numbness in right hand.

Diagnosis was mainly based on a combination of signs, symptoms and electrophysiological findings. For example, some required the demonstration of abnormal conduction in the median nerve as a conditioner inclusion, whereas others accepted positive physical signs as an alternative. In summary, it has been concluded that certain occupation having wrist activities materially increases the risk of carpal tunnel syndrome. Prolonged exposure to highly repetitive flexion and extension of the wrist should be avoided.

REFERENCES

1. Karjalainen A.Niederlaender E. *Occupational diseases in Europe in 2001.European Communities: Statistics in focus*, 15/2004
2. Bundesministerium für Arbeit und Sozialordnung Wissenschaftliche Begründung für die Berufskrankheit, Druckschädigung des Servus medianus; *carpel tunnel*. Gemeinsames Ministerialblatt. 2009;27:573-581 [Google Scholar]
3. Richard L. Drake, A. Wayne Vogl, Adam W.M.Mitchell. *Grays' Anatomy - 2nd Edition*, 2010
4. Ferry S, Pritchard T, Keenan J, Croft P, Silman A. *Estimating the prevalence of delayed median nerve conduction in the general population. Br J Rheumatol*. 1998;37:630–635. [PubMed][Google Scholar]
5. de Krom MC, Knipschild PG, Kester AD, Thijs C, Boekkooi PF, Spaaris F. *Carpal tunnel syndrome: prevalence in the general population. J Clin Epidemiol*. 1992;45:373–376. [PubMed][Google Scholar]
6. Reading I, Walker-Bone K, Palmer KT, Cooper C, Coggon D. *Anatomic distribution of sensory symptoms in the hand and their relation to neck pain, psychosocial variables and occupational activities. Am J Epidemiol*. 2003;157:524–530. [PubMed][Google Scholar]
7. Stevens JC, Sun S, Beard CM, OFallon WM, Kurland LT. *Carpal tunnel syndrome in Rochester, Minnesota, 1961 to 1980. Neurology*. 1988;38:134–138. [PubMed][Google Scholar]
8. Vessey MP, Villard Mackintosh L, Yeates D. *Epidemiology of carpal tunnel syndrome in women of childbearing age. Findings in a large cohort study. Int J Epidemiol*. 1990;19:655–659. [PubMed][Google Scholar]
9. McCormick A, Fleming D, Charlton J. *Morbidity statistics from general practice. 4th National Study 1991-2*. HMSO; London: 1992. Series MBS No 3. [Google Scholar]
10. McCormack RR, Jr, Inman RD, Wells A, Berntsen C, Imbus HR. *Prevalence of tendinitis and related disorders of the upper extremity in a manufacturing workforce. J Rheumatol*. 1990;17:958–964. [PubMed][Google Scholar]
11. Silverstein BA. *The prevalence of upper extremity cumulative disorders in industry (Thesis)* The University of Michigan, Occupational Health and Safety; 1985. [Google Scholar]