

CARPAL TUNNEL SYNDROME

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INTRODUCTION

Background

Carpal tunnel syndrome (CTS) arises from compression of the median nerve where it passes through the carpal tunnel in the wrist. The classical presentations are burning sensations, pins and needles and/or numbness in the distribution of the median nerve. This typically occurs initially at night, and then early in the morning. Other symptoms include weakness of thumb grip, a history of dropping things, and clumsiness of fine finger function. CTS is one of the common musculoskeletal problems among dental personnel. Prolonged work with highly repetitious flexion and extension of the wrist, and forceful grip task was shown to increase the risk to develop CTS.¹

August 1990, OSHA began a nationwide program to help decrease worker exposure to ergonomic hazards. According to the Bureau of Labor Statistics (1990), MCTD account for 48% of work-related injuries in the private sector. A recent review of workers' compensation records revealed that reports of MCTD have also increased for the U.S. Army. The expense is considerable in lost work time, medical treatment, rehabilitation, and diminished morale. The estimated workers' compensation cost for the Army for one case of carpal tunnel syndrome (CTS) is approximately \$10,000.

Workplace factors are thought to be causative elements in 47% of all cases of CTS. Occupations considered at risk for development of upper extremity MCTD (including CTS) include office workers, cashiers, assembly-line industry workers, meat cutters, butchers, musicians, cooks, and dental hygienists. Work-related musculoskeletal injuries or illnesses reported by dental hygienists involve areas of the back, neck, shoulder, elbow, wrist, and

hand, as well as varicose veins and eye strain. Among dental workers, work-related pain has been reported to be high for the back (44%), neck (62%), and shoulders (80%), and for the three combined (72%). A study of Minnesota dental hygienists revealed that 7% had been diagnosed as having CTS, whereas 63% reported experiencing one or more symptoms associated with CTS. Similar results were found among California dental hygienists, among whom 6.4% of those surveyed had been diagnosed with CTS.²

Dentist surgeons and dental hygienists have been reported to have a high prevalence of upper extremity musculoskeletal disorders (MSDs), including CTS. Dentists with more clinical experience were diagnosed with CTS. This was supported by Lalumandier and McPhee who found that dental hygienists who practiced for >10 years were more likely to develop CTS. Although CTS if left untreated, it can lead to complete, irreversible median nerve damage, with severe loss of hand function.³

Problem Statement

Carpal tunnel syndrome (CTS) is an important cause of work disability. There is controversy over the relation between carpal tunnel syndrome and occupation. The aim of this study was to assess the relationship between practicing dentistry and the development of carpal tunnel syndrome.

Objective: To provide general information about
Carpal tunnel syndrome (CTS)

LITERATURE REVIEW

Carpal Tunnel syndrome

Carpal Tunnel Syndrome is also a kind of Musculoskeletal Disorder which occurs while doing same job with hand for prolonged time. CTS develop into the complete disorder when the median nerve from forearm to the palm of the hand is pressed or squeezed. The symptoms of CTS include pain in hands and fingers, numbness in fingers, tingling in hands. CTS being the WRMSD which got into notice among researchers. High force and repetitive work combination can be the main reason for the Carpal Tunnel Syndrome. The prevalence of the CTS among 652 workers in jobs with specific hand force and repetitiveness. Occurrence of CTS was 0.6% in low force less repetitive jobs and 5.6% in high force more repetitive jobs.⁴

PREDISPOSING FACTORS

- Genetic predisposition: the carpal tunnel is smaller in some people than in others
- Repetitive movements: Franklin *et al.* stated that people who repeatedly do the same movements with their wrists and hands may be more likely to develop CTS. People with certain types of jobs are more likely to have CTS, including dentists, manufacturing and assembly line workers, grocery store checkers, violinists and carpenters. In addition, CTS can be caused by some hobbies and sports that use repetitive hand movements, such as golfing, knitting and gardening
- Injury or trauma: Sesto *et al.* stated that swelling and pressure on the nerve can be caused by a sprain or a fracture of the wrist, increasing the risk of CTS. Strong vibrations caused by heavy machinery or power tools, along with forceful and stressful movements of the hand and wrist, can also cause trauma
- Pregnancy: Atroshi I *et al.* stated that pregnant women, especially during the last few months, are at greater risk of getting CTS because of hormonal changes during pregnancy and the build up of fluid. Most doctors treat CTS in

pregnant women with wrist splints or rest rather than surgery, as CTS almost always goes away following childbirth

- Menopause: during menopause, hormonal changes can put women at greater risk of getting CTS. In addition, the wrist structures become enlarged in some postmenopausal women, which can press on the wrist nerve
- Breast cancer: some women who have a mastectomy may get lymph oedema, where the build-up of fluids goes beyond the lymphatic system's ability to drain it. This causes pain and swelling of the arm
- Other medical conditions: people suffering from diabetes, hypothyroidism, lupus, obesity and rheumatoid arthritis are more likely to get CTS. In some of these patients, the normal structures in the wrist can become enlarged and lead to CTS.
- In addition, smokers with CTS usually have worse symptoms and recover more slowly than non-smokers.⁵

People at Increased Risk of Carpal Tunnel Syndrome

Women are three times more likely than men to develop carpal tunnel syndrome. People with diabetes or other metabolic disorders that directly affect the body's nerves and make them more susceptible to compression are also at high risk. CTS usually occurs only in adults. Workplace factors may contribute to existing pressure on or damage to the median nerve. The risk of developing CTS is not confined to people in a single industry or job, but may be more reported in those performing assembly line work such as manufacturing, sewing, finishing, cleaning, and meatpacking than it is among data entry personnel.⁶

Signs and Symptoms of Carpal Tunnel Syndrome

Symptoms usually start gradually, with frequent numbness or tingling in the fingers, especially the thumb and the index and middle fingers. Some people with CTS say their fingers feel useless and swollen, even though little or no swelling is apparent. The symptoms often first appear in one or both hands during the night. The dominant hand is usually affected first and produces the

most severe symptoms. A person with CTS may wake up feeling the need to “shake out” the hand or wrist. As symptoms worsen, people might feel tingling during the day, especially with certain activities such as talking on the phone, reading a book or newspaper, or driving. Hand weakness may make it difficult to grasp small objects or perform other manual tasks. In chronic and/or untreated cases, the muscles at the base of the thumb may waste away. Some people with very severe CTS cannot determine between hot and cold by touch, and may burn their fingertips without knowing it.⁶

Carpal tunnel syndrome is particularly associated with dentists involved in certain tasks, including:

- Repetitive hand motion
- Awkward hand position
- Strong gripping
- Mechanical stress on the palm
- Vibration.

Patients typically report pain and pins-and-needles in the distribution of the median nerve. According to Stockstill & Harn⁸ stated symptoms of carpal tunnel syndrome may include:

- Loss of sense of touch
- Tingling and numbness in hand and fingers
- Pain in shoulder at night, pain in elbow, or swelling in wrist area
- Loss of grip strength in hand
- Pain in wrist when stretched in an extreme position, such as bending wrist, pointing the fingers to the floor
- Dropping objects more often than usual
- A burning sensation in the wrist and hand area
- Being unable to unscrew a jar lid
- Tenderness in the wrist area
- More difficult to do tasks such as brushing hair.

Stevens *et al.* showed that the findings on physical examination (signs) are frequently absent or nonspecific. Tinel's sign (tapping on the wrist or over the median nerve) and Phelan's signs (forced flexion of the wrist) are frequently described. An electromyogram can also be used to check for muscle damage, where a needle is inserted into the muscle to record electrical activity in that muscle at rest and when contracted. Generally, symptoms can be better examined when the patient is not working or holidays when the worker has avoided workplace exposure. On examination, there is wasting of the muscles of the thenar eminence, absence of abduction of thumb at metacarpopharyngeal joint and absence of opposition of the thumb. In severe cases, sensation may be permanently lost and the muscles at the base of the thumb slowly shrink (thenaratrophy), causing difficulty with pinch. Relatively large number of dentists have a prolonged medianulnar latency.

Lam & Thurston stated that higher rate of hand and finger pain symptoms are seen among dentists than in the general population. This higher rate of pain is associated with dentists who reportedly work longer hours.

Physical Examination

Physical examination of the hand includes inspection of the hand and the wrist looking for signs of trauma or acute injury such as abrasions or ecchymosis, bony abnormalities of rheumatoid arthritis such as boutonniere deformity, ulnar deviation of the wrist, or swan neck deformity. Deformities of the wrist suggestive of osteoarthritis should also be noted. Although thenar atrophy is often associated with severe, prolonged CTS, this alone is not a diagnostic finding and cannot be used to rule out CTS if not present. The American Academy of Orthopaedic Surgeons (AAOS) released guidelines in early 2016 on clinical management of CTS. Clinicians have often used physical examination tests such as Phalen's test

(holding the wrists in a position of fixed flexion for 1 minute with reproduction of paresthesia), Tinel's sign (tapping over the median nerve that produces paresthesia), and flick sign as methods to aid in diagnosing.

The AAOS guidelines state that there is strong evidence supporting not using these tests as independent physical examination maneuvers, as each of these tests, when used alone, has a poor or weak association with diagnostic accuracy. The AAOS guidelines state that there is moderate evidence in the use of diagnostic questionnaires and electrodiagnostic studies for the diagnosis of CTS.

Physical examination of the patient's hands, arms, shoulders, and neck can help determine if the complaints are related to daily activities or to an underlying disorder, and can rule out other painful conditions that mimic carpal tunnel syndrome. The wrist is examined for:

- Tenderness
- Swelling
- Warmth
- Discolouration.

The muscles at the base of the hand should be examined for strength and signs of atrophy; each finger should be tested for sensation. Routine laboratory tests and X-rays can reveal:

- Diabetes
- Arthritis
- Fractures.

The presence of CTS is suggested if one or more symptoms, such as tingling or increasing numbness is felt in the fingers within 1 minute. Doctors may also ask patients to try to repeat the movements that bring on symptoms.

Tests

Electrodiagnostic tests are often used to confirm the diagnosis. In a nerve conduction study, electrodes are placed on the hand and wrist. Small electric shocks are applied to measure the speed with which nerves transmit impulses.

In electromyography, a fine needle is inserted into a muscle, the severity of damage to the median nerve can be determined by electrical activity viewed on a screen. Impaired movement of the median nerve can be seen by ultrasound imaging. Magnetic resonance imaging can show the anatomy of the wrist, but until now has not been especially useful in diagnosing carpal tunnel syndrome.

How is carpal tunnel syndrome treated?⁶

Treatments for carpal tunnel syndrome should begin as early as possible, under a doctor's direction. Underlying causes such as diabetes or arthritis should be treated first.

Non-surgical treatments

- Splinting. Initial treatment is usually a splint worn at night. Wrist Splint: Field et al. recommend that the wrist be supported and braced by wearing a splint in a neutral position so that the nerves and tendons can recover. A splint can be worn 24 hours a day or only at night. Wearing a splint at night sometimes helps to reduce the pain. Splinting can work the best when done within 3 months of having any symptoms of CTS
- Avoiding daytime activities that may
- provoke symptoms. Some people with slight discomfort may wish to take frequent breaks from tasks, to rest the hand. If the wrist is red, warm and swollen, applying cool packs can help.
- Over-the-counter drugs. In special circumstances, various medications can ease the pain and swelling associated with carpal tunnel syndrome. Nonsteroidal anti-inflammatory drugs

(NSAIDs), such as aspirin, ibuprofen, and other nonprescription pain relievers, may provide some short-term relief from discomfort but haven't been shown to treat CTS.

- Prescription medicines. Corticosteroids (such as prednisone) or the drug lidocaine can be injected directly into the wrist or taken by mouth (in the case of prednisone) to relieve pressure on the median nerve in people with mild or intermittent symptoms. (Caution: individuals with diabetes and those who may be predisposed to diabetes should note that prolonged use of corticosteroids can make it difficult to regulate insulin levels.)
- Rest: stopping or doing less of a repetitive movement may be all that is needed, for people with mild CTS. Your doctor will advise you about the steps that should take to prevent CTS from recurring. These steps will include rest, stretching and bending the hand and wrists at intervals of 20 minutes, alternating tasks and changing work position frequently. It is important to be aware of any onset of headaches, fatigue or muscle pain during activities.

Alternative therapies. Acupuncture and chiropractic care have benefited some individuals but their effectiveness remains unproved. An exception is yoga, which has been shown to reduce pain and improve grip strength among those with CTS.

Surgery

Carpal tunnel release is one of the most common surgical procedures in the United States. Generally, surgery involves severing a ligament around the wrist to reduce pressure on the median nerve. Surgery is usually done under local or regional anesthesia (involving some sedation) and does not require an overnight hospital stay. Many people require surgery on both hands. While all carpal tunnel surgery involves cutting

the ligament to relieve the pressure on the nerve, there are two different methods used by surgeons to accomplish this.

Open release surgery, the traditional procedure used to correct carpal tunnel syndrome, consists of making an incision up to 2 inches in the wrist and then cutting the carpal ligament to enlarge the carpal tunnel. The procedure is generally done under local anesthesia on an outpatient basis, unless there are unusual medical conditions.

Endoscopic surgery may allow somewhat faster functional recovery and less post-operative discomfort than traditional open release surgery but it may also have a higher risk of complications and the need for additional surgery. The surgeon makes one or two incisions (about 1/2 inch each) in the wrist and palm, inserts a camera attached to a tube, observes the nerve, ligament, and tendons on a monitor, and cuts the carpal ligament (the tissue that holds joints together) with a small knife that is inserted through the tube. Following the surgery, the ligaments usually grow back together and allow more space than before. Although symptoms may be relieved immediately after surgery, full recovery from carpal tunnel surgery can take months. Some individuals may have infections, nerve damage, stiffness, and pain at the scar. Almost always there is a decrease in grip strength, which improves over time. Most people need to modify work activity for several weeks following surgery, and some people may need to adjust job duties or even change jobs after recovery from surgery.

Recurrence of carpal tunnel syndrome following treatment is rare. Less than half of individuals report their hand(s) feeling completely normal following surgery. Some residual numbness or weakness is common.⁶

Carpal Tunnel Syndrome as an Occupational Disease

High-risk tasks and occupations

There is sufficient pathophysiological and epidemiological evidence for a causal connection to be assumed between manual tasks in various occupations and the occurrence of CTS. Occupational reasons include repetitive bending movements of wrist, to catch devices forcefully with ulnar deviation of hand and repetitive pressure on palm. In dentistry practices, these movements (especially repetitive movements of wrist) are used during exfoliation and canal cleaning that can compress median nerve. Generally type of movements and hand position are repetitive in dental practice. Dentists use ring finger as fulcrum and they keep their fingers forcefully when they are doing exfoliation, extraction, canal cleaning, and movement of hand wrist. This pressure on fingers and repetitive movements of wrist will cause this feeling. Hence, dental practices are one of the occupational risk factors for this syndrome. Getting rid of pain is essential for continuation of daily tasks.

A feature common to these tasks is hand movements that are liable to lead to an increase in the volume of tissue in the carpal tunnel and thus to an increase in pressure on the median nerve. Such tasks may form part of the work of people in many different occupational groups. In assessing the probability of a causal link in an individual case, one needs to look at the actual tasks 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 finger flexors and thus forced postures of the fingers and wrist, so that several components of exposure are present simultaneously. A recent review indicated, for example, that CTS may be attributed to work-related factors in people whose occupations involve average demands of >4 kg on hand strength or repetitive tasks with cycle times <10 seconds, or similar repetitive tasks in more than half of the cycle periods.

There is considerable discrepancy in the results with regard to working with a computer keyboard and mouse, due to heterogeneous diagnostic criteria, lack of comparability between study designs, and a large number of individual and psychosocial factors.⁸

REFERENCES

1. Munirah MA, Normastura AR, Azizah Y, Aziah D. Prevalence of Probable Carpal Tunnel Syndrome and its Associated Factors among Dentists in Kelantan. *International Journal of Collaborative Research on Internal Medicine & Public Health*. Vol. 6 No. 8.2014
2. Rice VJ, Nindl B, Pentikis JS. Dental Workers, Musculoskeletal Cumulative Trauma, and Carpal Tunnel Syndrome Who is at Risk? A Pilot Study. *International Journal of Occupational Safety and Ergonomics* 1996, Vol. 2, NO. 3, 218-233. DOI: 10.1080/10803548.1996.11076350
3. Dipika Inbasekaran, M. Sankari, S. Gopal Nambi. Prevalence of carpal tunnel syndrome among dentists in Chennai, India. *Drug Invention Today | Vol 10 • Special Issue 3 • 2018*. ISSN: 0975-7619
4. Bhatia V. Ergonomic Design of Dental Scaling Hand Tools to Alleviate the Prevalence of Carpal Tunnel Syndrome in Dental Practitioners. *IJSRD - International Journal for Scientific Research & Development| Vol. 5, Issue 05, 2017* ISSN (online): 2321-0613.
5. Abichandani S, Shaikh S, Nadiger R. Carpal tunnel syndrome an occupational hazard facing dentistry. *International Dental Journal* 2013; 63: 230–236. DOI: 10.1111/idj.12037.
6. U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES National Institutes of Health. Carpal Tunnel Syndrome.
7. Durham CO, VanRavenstein K. It's All in the Wrist Diagnosis and Management of Carpal Tunnel Syndrome. *National Association of Orthopaedic Nursing*. September/October 2017 .Volume 36 .Number 5.

8. Giersiepen K, Spallek M. Carpal Tunnel Syndrome as an Occupational Disease.
Deutsches Ärzteblatt International | Dtsch Arztebl Int 2011; 108(14): 238–42