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ABSTRACT

Carpal tunnel syndrome (CTS) is one of a number of muscle - tendon and nerve related disorders that affect people performing intensive work with their hands. Hand and wrist disorders are receiving most of the attention although their symptoms are reported less often by dental workers than symptoms of neck/ back disorders. The lack of data pertaining to the behaviour of Indian general dental practitioners towards carpal tunnel syndrome was the basis behind this descriptive study to evaluate the prevalence of carpal tunnel syndrome symptoms.

Key words: Carpal Tunnel Syndrome, Median Nerve, Thenar Muscle, Carpal Tunnel, Transverse Carpal Tunnel Ligament. (Flexor Retinaculum)

Carpal Tunnel Syndrome: Survey of an occupational hazard

INTRODUCTION

Carpal tunnel syndrome (CTS) is a common condition that occurs when there is too much pressure on the median nerve in the wrist (1). CTS is a muscle-tendon and nerve related disorder that affects people performing intensive work with their hands. There is usually aching, numbness or tingling in the thumb, some of the fingers and sometimes, part of the hand.

An American Dental Association survey in 1997(2) reported that 9.2% of dentists had been diagnosed by the physician as having some type of repetitive motion disorder. The prevalence was higher among female and older dentists. Within this group of dentists who had diagnosed repetitive motion disorder, approximately 19 percent required surgery and more than 40 percent shortened their work hours.

CTS is triggered by the person's occupation. Most cases of CTS can be prevented by stopping or reducing the activity that stresses the fingers, wrist, or hand.

The purpose of this study was to assess the prevalence of carpal tunnel syndrome related symptoms in a sample of 300 dentists with a high occupational exposure.

MATERIALS AND METHODS

A 10 questionnaire response form was developed and circulated among 300 dentists residing in the city of Chennai. Survey was done among the dentists who have clinical experience more than 5 years. To assess the prevalence of symptoms attributed to carpal tunnel syndrome, detailed questions were asked about the signs and symptoms.

From the returned questionnaires, the diagnosis of symptoms to carpal tunnel syndrome was determined by the authors in accordance with the following criteria (3).

Stage I: In this stage, pain is usually the presenting complaint and the patient complains of characteristic discomfort in the hand.

Stage II: In this stage, symptoms of tingling and numbness, itching, paresthesia are localized to areas supplied by median nerve.

Stage III: Here the patient complains of clumsiness in the hand and impairment of digital function.

Stage IV: In this stage, sensory loss in the median nerve distribution area can be elicited and there is obvious wasting of thenar muscle.

The data collected were categorical and statistically analyzed using the normal approximation to the binomial distribution.

RESULTS

Of the 300 respondents, a majority (195 respondents) of the dentists work for more than 5 hours in a day, while 105 dentists work less than 5 hours in a day.

Out of the 300 dentists assessed, 96 respondents gave an history consistent with symptoms of CTS. Of these, 74 respondents of the total sample size (25%) gave the history of symptoms correlating to stage I

**MEENAKSHI AMMAL DENTAL COLLEGE, CHENNAI
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SURVEY FOR THE INCIDENCE OF CARPAL TUNNEL SYNDROME AMONG DENTISTS

Are you aware of carpal tunnel syndrome?

YES NO

Age - 25-30 years 30-35 years
 35-40 years 40-45 years
 45-50 years 50+ years

Sex - Male Female

Body Weight (Approximately) _____ Height _____

Years in Clinical Practice

1-10 years 10-20 years
 20-30 years 30+ years

Average Number of clinical hours you work in a day

1hr 2hrs
 3hrs 4hrs
 5hrs > 5hrs

Have you ever felt hand / finger numbness, tingling or pain at the end of the day?

YES NO

If yes,

Frequent burning
 Tingling / itching
 Numbness
 Pain
 Frequent dropping of instruments

CTS and 22 respondents of the total sample size (7 %) gave the symptoms correlating to Stage II CTS symptoms. Remaining 204 respondents of the total sample (68%) gave negative response to CTS symptoms (Fig. 1)(Table 1).

DISCUSSION

Carpal tunnel syndrome (CTS) is a condition that can

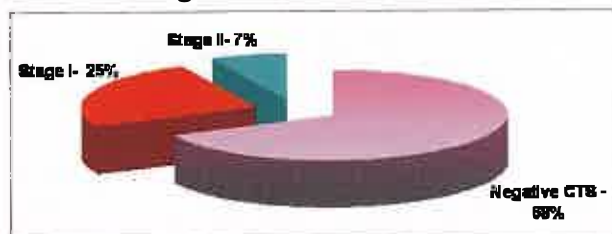
cause pain, tingling, numbness, and weakness in the fingers and thumb (4).

Specifically, CTS is the compression of the median nerve located in the wrist. This nerve supplies feeling sensation to the thumb, index, middle and ring finger. The carpal tunnel is a well defined space in the palm at the wrist. The two walls of this anatomical tunnel are formed by bones that support the wrist. The roof of the tunnel is the thick transverse carpal ligament (flexor retinaculum). Several

Table 1: Prevalence of CTS

Stages in CTS	Number (N)	Percentage (%)
Total sample	300	100 %
Negative CTS	204	68 %
Positive CTS	96	32 %
Stage I	74	25 %
Stage II	2	27 %

(N = 100)

Fig. 1: Prevalence of CTS

(N = 100)

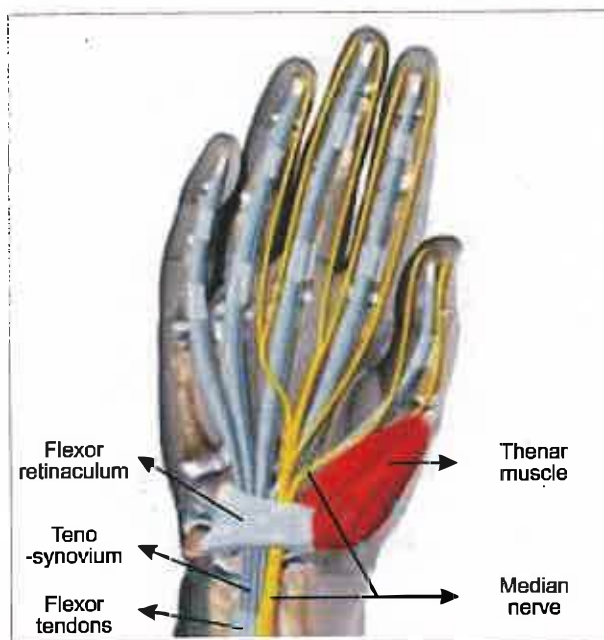
tendons and the median nerve pass through this tunnel (Fig. 2). Space in the tunnel decreases when the tendons swell or the ligament thickens. Pressure inside the tunnel increases and restricts blood flow to the nerve. The pressure is most noticeable when the wrist is fully extended or flexed. Because bones, ligaments, and tendons cannot be compressed, the soft median nerve is the only component in the carpal tunnel that can be pinched. When the lubricating linings around the tendons thicken because of repetitive or too forceful hand movements, the resulting pressure on the nerve causes pain, weakness, numbness, tingling, or a burning sensation (5).

There are two major causes (6) for the carpal tunnel syndrome

1. A poor posture in the neck and/or upper chest. The nerve fibers that make up the median nerve originate in the spinal cord in the neck, therefore poor posture in the neck and/or upper chest can cause symptoms of CTS.
2. Over-extending or flexing the wrist can cause the tendons in the wrist to swell, putting pressure on the median nerve as it passes through the carpal tunnel.

The ergonomic risk factors (7) associated with CTS include repetitiveness of work, forceful exertions, mechanical stress, posture, temperature, and vibration. These risk factors are present for dentists and dental hygienists (8). Dental instruments may cause contact stress over the carpal tunnel and the wrist may be held in awkward positions for prolonged periods. In addition to repetitive work and contact stresses, dentists may be exposed to other potential risk factors, such as the use of potentially restrictive ambidextrous gloves (9).

In addition to ergonomic risk factors, there are several other factors and medical conditions (10, 11) associated

Fig. 2: Carpal tunnel in the wrist region

with risk of developing CTS. There is higher prevalence of CTS among women and due to over activity of pituitary gland, hypothyroidism, rheumatoid arthritis, and diabetes. Obese people (11) are also more prone to the entrapment of median nerve at the wrist.

Diagnostic tests (3)

These are provocative tests and act as important screening methods and as an adjunct to the electron physiologic testing.

Wrist Flexion (Phalen's Test)

The patient is asked to actively place the wrist in complete but unforced flexion (Fig. 3). If tingling and numbness are produced in the median nerve distribution of the hand within 60 seconds, the test is positive. It is the most sensitive provocative test. It has a specificity of 80 per cent.

Tourniquet test

A pneumatic blood pressure cuff is applied proximal to the elbow and inflated higher than the patient's systolic blood pressure. The test is positive if there is paraesthesia or numbness in the region of median nerve distribution of the hand. It is less reliable and is specific in 65 per cent of cases only.

Median nerve percussion test

The examiner gently taps the median nerve at the wrist. The test is positive if there is tingling sensation. Seen only in 45 percent of cases (Fig. 4).

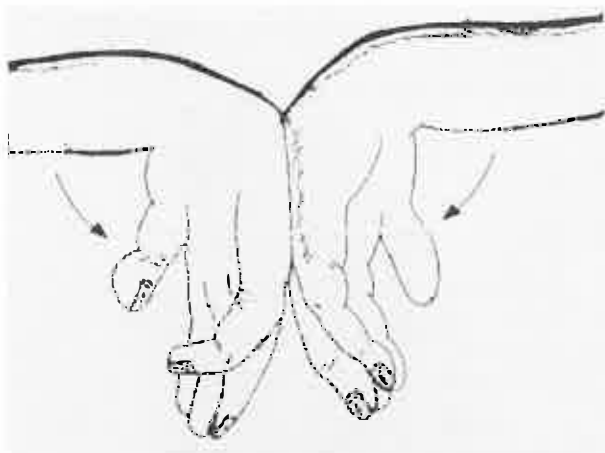


Fig. 3: Phalen's test

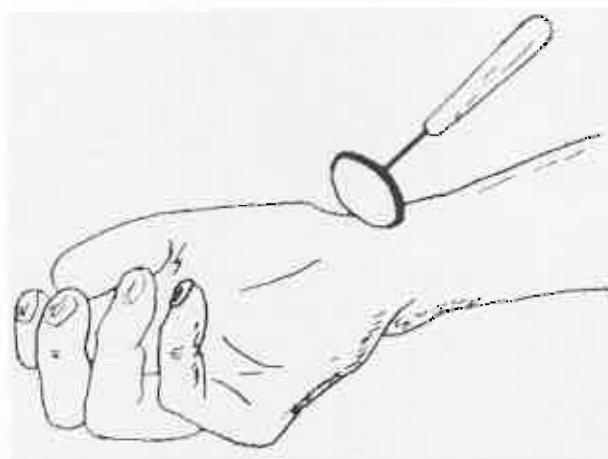


Fig. 3: Median nerve compression test

Median nerve compression test

Direct pressure is exerted equally over both wrists by the examiner (Fig. 5). The first phase of the test is the time taken for symptoms to appear (15 sec to 2 min). The second phase is the time taken for the symptoms to disappear after release of pressure.

Classification of CTS (12)

0: Asymptomatic median nerve pathology

Does not need treatment?
Need prophylactic work modification

1A: Subclinical median nerve irritability

Phalen's or Tinel's sign positive
No motor/sensory deficit
Normal NCS.

Does not need treatment? Need prophylactic work modification.

Treatment: Prophylactic work modification (13) includes neutral positioning of the hand wrist region while instrumentation and also includes correct posture while working.

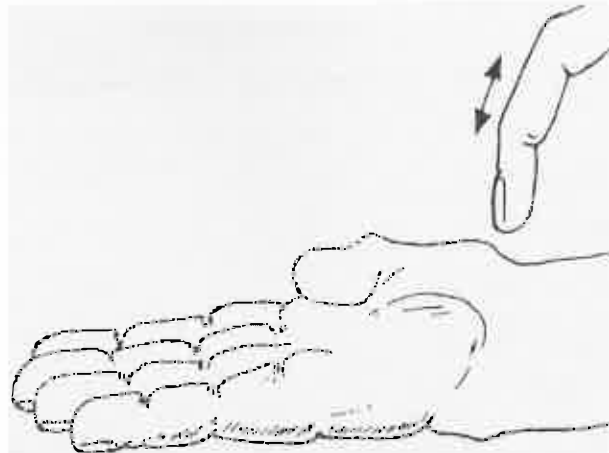


Fig. 4: Median nerve percussion test

1B: Mild CTS

Brief numbness
Tingling wrist pain at night or with repetitive use or sustained gripping.
No motor/ sensory deficit

Symptoms disappear with treatment or underlying disorder corrected or with modification of activity.
Benefit from conservative treatment.

Treatment: In the initial stages, NSAIDS (3) are given. If it is unsuccessful steroids like prednisolone for 8 days starting with 40mg for 2 days and tapering by 10mg every 2 days are tried. Use of carpal tunnel splint is also advocated. Regular exercises are also advised.

1C: Moderate CTS

Frequent symptoms
Signs of Median nerve irritability
Mild sensory loss
No motor weakness
NCS abnormal.

2: Severe CTS

Continuous symptoms
Sensory and motor deficit
Median nerve sensory and motor conduction abnormal.
Denervation on EMG.
Splinting may help.

Surgery: recovery is slow and incomplete.

Treatment: Injection of single infusion of cortisone (14) with splinting for 3 weeks is tried in patients with intermittent symptoms, duration of complaint less than 1 year and if there is no sensory deficits, no marked thenar wasting.

Surgery (14) consists of division of flexor retinaculum (transverse carpal ligament) and is indicated in failed non operative treatment, thenar atrophy, and sensory loss.

CONCLUSION

This occupational hazard is associated with dentists who reportedly work longer hours with improper hand-wrist position and improper operator and chair positions.

For people who have symptoms of CTS or are at increased risk of developing the condition, early intervention can be important. When recognized early, CTS can be managed with conservative and non-invasive treatment (2) such as

1. Direct instrument pressure over the carpal tunnel can be reduced by the use of large handled instruments that distribute pressure over a large surface area.
2. Pacing of work activity can be helpful as extended wrist flexion or extension can place the median at risk. A short break from activity to reduce the pressure on the nerve and prevent injury.
3. The use of properly fitting gloves reduces hand tension.
4. Night time wrist splint helps the patient to avoid wrist flexion and extension extremities during sleep and thus decreases the pressure, on median nerve
5. Avoidance of awkward posture during procedures reduces the stress on median nerve.

Early recognition of symptoms and education regarding risk factors is important in the successful management of CTS.

REFERENCES

1. Franklin GM, Haug J, Heyer N, Checkoway H,

Peck N: Occupational carpal tunnel syndrome in Washington state, 1984-1988, *Am J Public Health*, 81 (6): 741-6, 1991.

2. Hamann C, Werner RA, Franzblaur A, Rodgers P, Siew C, Grunier S: Prevalence of carpal tunnel syndrome and median nerve mononeuropathy among dentists, *JADA*, vol. 132: 163-170, 2001.
3. Spackman W, Pedritten: *Book of Occupational Therapy*, 5th ed, 198-200.
4. http://www.ninds.nih.gov/health_and_medical/pubs/carpal_tunnel.htm.
5. Atroshi I, Gummesson C, Johnsson R, Ornstein E, Ranstam J, Rosen I: Prevalence of carpal tunnel syndrome in general population, *JAMA*, 282(2):153-8, 1999.
6. Jill S, Nield-G Ehrig, Ginger ANN Houseman: *Fundamentals of periodontal Instrumentation*, 3rd ed, 16.
7. Branson J B, Smith S, Romagnoli G: Evaluation of dental office ergonomics: risk factors and hazards, *JADA*, 129 (2): 174-83, 1998.
8. Osborn J.B, Newell K.J, Rudney JD, Stoltenberg JL: Carpal tunnel syndrome among Minnesota and dental hygienists, *J Dent Hyg*, 64(2): 79-85, 1990.
9. Powell BJ, Winkley GP, Brown JO, Etersque S: Evaluating the risk of ambidextrous and fitted gloves: implications for hand discomfort, *JADA*, 125(9):1235-42, 1994.
10. Werner RA, Armstrong TJ: Carpal tunnel syndrome: ergonomic risk factors and intra carpal canal pressure, *Phys Med Rehabil Clin N*
11. Lam N, Thurston A: Association of obesity, gender, age, and occupation with carpal tunnel s syndrome, *Aust NZ J Surg*, 68 (3): 190-4, 1998.
12. Dawson, DM, Hallett, Wilbourn AJ: *Entrapment Neuropathies*, 3rd 3d., 20-94.
13. Jill S, Nield-Gehrig, Ginger ANN Houseman. *Fundamentals of periodontal Instrumentation*, 3rd ed, 73-6.
14. http://hcd2.bupa.co.uk/fact_sheets/mosby_factsheets/carpal_tunnel.html.