IAEM Clinical Guideline

Carpal Tunnel Syndrome

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Revision History

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GLOSSARY

GLOSSARY OF ABBREVIATIONS

CTS	Carpal Tunnel Syndrome
ED	Emergency Department
HbA1c	Glycated Haemoglobin
OT	Occupational Therapy

GLOSSARY OF TERMS

Clinician	A health care professional with direct patient contact
Neuropathy	When nerve damage leads to pain weakness, numbness or swelling in one or more parts of the body.
Sensitivity	Probability of a positive test result conditioned on an individual being truly positive (true positive rate).
Specificity	Probability of a negative test result, conditioned on an individual truly being negative (true negative rate).
Thenar Eminence	The mound formed on the base of the thumb on the palm of the hand by the intrinsic muscles of the thumb (Abductor Pollicis Brevis, Flexor Pollicis Brevis, Opponens Pollicis).

Carpal Tunnel Syndrome

INTRODUCTION

Carpal Tunnel Syndrome (CTS) is a type of entrapment neuropathy, caused by the compression and/or irritation of the median nerve from a range of causes such as repetitive overuse, arthritis, pregnancy etc. It is compressed under the transverse carpal ligament as it travels through the narrow carpal tunnel in the wrist.[1] Although not an emergency condition it can sometimes present symptomatically to ambulatory care areas as it is the most common entrapment neuropathy.

Classically, patients describe pain, burning, tingling or numbness in the sensory distribution of the median nerve as it passes through the carpal tunnel, encompassing the palmar aspect of the thumb, index and middle fingers, the radial half of the ring finger and the terminal parts on the dorsal aspect of the hand.[2]

In severe manifestations, permanent diminishment of skin sensation may occur.[2] As the median nerve supplies the abductor pollicis brevis, opponens pollicis, part of the flexor pollicis brevis and two lateral lumbrical muscles, compression eventually leads to atrophy of the thenar eminence.[2]

PARAMETERS

Target Audience This guideline is intended for the use of all Emergency Medicine clinicians involved in the diagnosis and care of patients with suspected CTS in the Emergency Department (ED).

Patient Population This guideline is intended for adult patients attending the ED with suspected CTS.

Exclusion Criteria Patients under 16 years of age.

AIMS

The aim of this guideline is to provide an updated and evidence-based guideline on the assessment, diagnosis and treatment of patients with suspected CTS who present to the ED.

EPIDEMIOLOGY

CTS is considered the most common entrapment neuropathy with an incidence of 2.5 per 1,000 per year.[3] It has an estimated lifetime risk of 10% which rises to 84% in patients who suffer from diabetes.[4] The prevalence of CTS exhibits a higher incidence among females compared to males, with reported ratios ranging between 3:1 and 10:1.[3]

New cases frequently present earlier in women and are seen between 45-54 years as compared to men when they present between 75-84 years.[5] Patients over 65 years of age tend to present with more severe and possibly more rapidly progressing CTS. It is also often transiently present in late pregnancy.[5]

ASSESSMENT

History

1) Initial Presenting Complaint

- CTS initially presents as intermittent ‘pins and needles’ (paraesthesia), tingling, burning or aching pain in the hand and fingers. It can also less frequently present with weakness of grip, dryness or colour change in the hand.[2]

2) Site

- Pain, tingling, pins and needles and numbness most commonly affect the palmar surface of the thumb, index, middle, and medial half of the ring finger.
- CTS is frequently bilateral (55-65% of cases at first presentation).[2]

3) Radiation

- Symptoms may radiate through the forearm to the elbow and even as high up as the shoulder.[2]

4) Aggravating Factors

- Symptoms are often worse at night. If numbness or pain of the median nerve distribution wakes a patient from their sleep, this is indicative of CTS.[1]
- Aggravating factors include driving, typing, texting, holding a phone to your ear, playing the piano or using vibrating tools (e.g. Jackhammer).[7]

5) Relieving Factors

- Relieving factors include flicking the wrist (Flick Sign), running hands under warm water or changing hand position.[8]

6) Progression

- Over time, numbness may progress from intermittent in nature to constant.[1]
- In time, patients may report being more clumsy and dropping things due to decreased hand dexterity and weakness, especially of the thumb. Closing buttons and opening jars may become problematic.[12]

7) Risk Factors

- Relevant risk factors include occupations involving forceful or repetitive hand or wrist movements, elevated body mass index, female gender, perimenopause, diabetes mellitus, rheumatoid arthritis, hypertension, hypothyroidism and pregnancy.[10-12]

8) Differential Diagnosis[12]

Cubital Tunnel Syndrome	Caused by ulnar nerve compression at the elbow leading to numbness of the ulnar half of the ring finger and little finger. The thumb is spared. There can be rapid weakening of hand grip.
Cervical Nerve Root Entrapment	Compression of C6/7 nerve roots can present with neck pain and radiation of pain and numbness down the arm into the hand. The thumb and index finger are often affected.
De Quervain's Tenosynovitis	Irritation of the thumb tendons where they run through the fibrous sheath causes pain over the distal radial styloid.
Osteoarthritis	Osteoarthritis of the metacarpophalangeal joint of the thumb causes pain reproduced by twisting activities such as turning keys or opening jars.
Inflammatory Arthritis	Associated with morning stiffness and joint swelling.

Infected Carpal Tunnel Syndrome	Seen after trauma or surgical carpal tunnel release. Associated with pain, erythema or oedema closely associated with a wound / incision over the carpal tunnel. Kanavel's four classic signs (fusiform symmetric swelling of the entire digit, digits held in partial flexion, tenderness along the flexor tendon sheath, pain along the tendon with passive digit extension) may be present.

Examination

1) Inspection

- Examine the whole limb.
- Look for dry skin, swelling or colour changes in the hand.
- Assess for wasting of the thenar eminence as this is very good at ruling in CTS. However, it is less effective at ruling out CTS, with a sensitivity of 4%–28% and specificity of 82%–99%.[10-12]

2) Motor Exam

- Assess for weak thumb abduction (abductor pollicis brevis).
- Ask the patient to lay their hand on the table with their palm facing upwards and their thumb extended upwards. Advise them to keep it in this position whilst you apply downward pressure – “Point your thumb to the ceiling and don’t let me push it down.”
- Simultaneously use your index finger to palpate their thenar eminence feeling for the degree of muscle contraction. This has a sensitivity of 63% and a specificity of 66% for diagnosing CTS.[3,11]
- Conduct provocation tests.

Figure 1: Thumb abduction

3) Sensory Exam

- Test the sensation of the hand along the median nerve distribution [6,10-12]

Figure 2: Median Nerve sensory distribution

Provocation Tests

Phalen's Test (Reverse Prayer Sign)

- Ask the patient to hyperflex both wrists while pressing the dorsal side of both hands against each other, and to hold this position for up to one minute. The test is positive if pain, paraesthesia or numbness is elicited along the median nerve distribution in the affected hand.
- Alternatively, ask the patient to flex their elbows on a table, keeping their forearm vertical and let the wrists fall into gravity assisted flexion with extended fingers for up to one minute.
- The sensitivity of this test ranges from 10% to 91% and the specificity ranges from 33% to 86%. [1,9-12]

Figure 3: Phalen's test

Reverse Phalen's Test (Prayer Sign)

- Ask the patient to place both palms of their hands together causing forced wrist extension for one minute.
- The test is positive if paraesthesia is elicited along the median nerve sensory distribution.[8,10]

Figure 4: Reverse Phalen's Test

Tinel's Test

- Gently tap over the median nerve in the palmar aspect of the wrist.
- The use of a tendon hammer can increase the sensitivity of the test.
- The test is positive if the patient experiences paraesthesia along the sensory distribution of the median nerve.
- The sensitivity of this test ranges from 23 to 60% and the specificity ranges from 64% to 87%. [1,6,8-11]

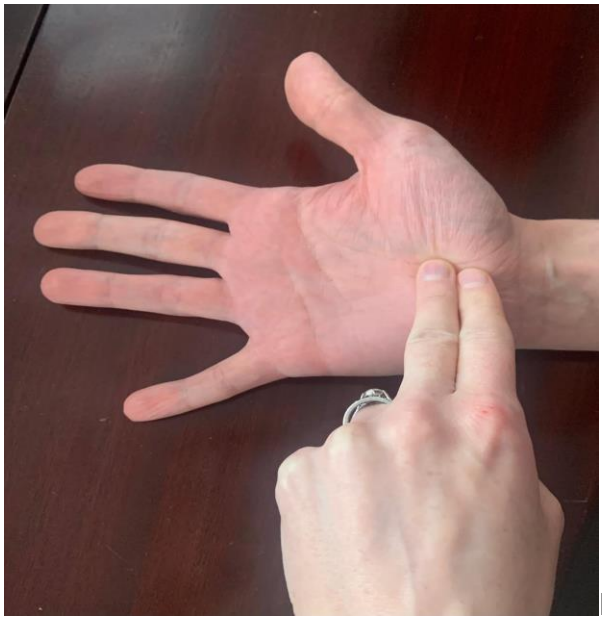

Figure 5: Tinel's test

Hand Elevation Test

- Ask the patient to hold their hands above their head against gravity for up to two minutes.
- The test is positive if tingling or numbness is felt along the median nerve distribution of the fingers.
- This is the most specific of all the provocation tests.
- The sensitivity of this test is 88%, and the specificity is 99%.[11]

INVESTIGATIONS

- CTS is predominantly a clinical diagnosis.
- Blood tests such as HbA1c can be considered to exclude diabetes mellitus, as this is a risk factor for CTS.
- Nerve conduction studies are reserved for patients in whom the diagnosis is uncertain or who are being considered for surgical intervention.[6]

MANAGEMENT

1) Lifestyle Modification

- Avoid repetitive / sustained hand or wrist movements.[12]

2) Optimise Modifiable Risk Factors

- Obtain tighter glycaemic control in diabetes, reduced body mass index, euthyroid optimisation in hypothyroidism.

3) Wrist Splint

- Wear a palmar removable wrist splint that maintains the wrist in a neutral position at night.
- It should be worn for at least four to eight weeks. Symptomatic improvement should be seen within two weeks.[11]
- This can decrease direct compression over the carpal tunnel providing symptom relief and improving nocturnal exacerbations.[6,10]

4) Surgery

- Definitive treatment.

- Carpal tunnel decompression can be done either endoscopically or via the standard open approach.
- This involves relieving the pressure exerted on the median nerve by making an incision in the transverse carpal ligament. This is often done as a day procedure.
- The initial success rates surpass 90%, however the success rate at five years is about 60%.[10,11]

5) Further Follow up

- For non-traumatic presentations of CTS to the ED, refer to primary care or hand OT if available locally

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Image References:

Figure 1-5: Own images – Dr N Mitchell