CONDITION

Carpal tunnel syndrome

Learn how carpal tunnel syndrome causes hand numbness, tingling, and weakness, and how it is diagnosed, treated, and monitored.

WHAT IT IS
Median nerve compression at the wrist

BODY SYSTEM
Nervous system

MAIN SYMPTOMS
Hand numbness, tingling, weakness, difficulty with fine movements

WHAT CAUSES IT
Mechanical compression, often no single cause

HOW IT IS DIAGNOSED
History and examination, sometimes nerve conduction studies and EMG

MAIN TREATMENT
Nonsurgical care or carpal tunnel release

CAN IT BE CURED?
Sometimes - treatment can relieve nerve pressure

IS IT AN EMERGENCY?
Sometimes - rapid severe pain and numbness after wrist injury

LONG-TERM OUTLOOK
Advanced nerve damage may not fully recover

Overview

Carpal tunnel syndrome occurs when the median nerve is compressed at the wrist. This nerve supplies feeling to the thumb, index finger, middle finger, and part of the ring finger. It also controls some muscles at the base of the thumb.

The median nerve and several finger tendons pass through a narrow space in the wrist called the carpal tunnel. The floor and sides of the tunnel are formed by wrist bones. A strong band of tissue, called the transverse carpal ligament, forms the roof. Swelling or reduced space inside the tunnel can place pressure on the nerve.

Symptoms often begin with occasional numbness or tingling, especially at night. Over time, symptoms may become more frequent and can include hand weakness or difficulty with fine movements. Early assessment matters because long-lasting, severe nerve compression may

lead to permanent loss of feeling or muscle strength.

Carpal tunnel syndrome can affect one or both hands. Treatment depends on how long symptoms have been present, how much they interfere with daily life, and whether testing shows nerve damage. Many people start with nonsurgical treatment. Surgery may be considered when symptoms are severe, do not improve, or are causing weakness or ongoing numbness.

Symptoms

Symptoms usually develop gradually. They may come and go at first and then become more persistent.

Common symptoms include:

The little finger is usually not affected because it is supplied by a different nerve. Numbness that mainly involves the little finger may point to another problem, such as compression of the ulnar nerve.

With more advanced compression, numbness may become constant. The muscles at the base of the thumb may become weak or smaller. This muscle loss is called thenar atrophy.

Hand symptoms are not always caused by carpal tunnel syndrome. Arthritis, tendon problems, nerve compression in the neck or elbow, and conditions affecting nerves throughout the body can cause similar symptoms.

Arrange a medical assessment if symptoms are persistent, regularly disturb sleep, affect work or daily activities, or are accompanied by weakness. Sudden severe wrist pain, swelling, or numbness after a fracture, crush injury, burn, bleeding, or placement of a tight cast requires urgent evaluation because pressure on the nerve may have developed quickly.

Sudden arm numbness with facial weakness, trouble speaking, severe dizziness, or loss of coordination is not typical of carpal tunnel syndrome. Seek emergency help because these may be signs of a stroke.

- Numbness, tingling, burning, or an "electric shock" feeling in the thumb, index finger, middle finger, or thumb-side of the ring finger
- Symptoms that wake you from sleep or are worse in the morning
- Discomfort that travels from the wrist into the hand or up the forearm
- A need to shake or move the hand to reduce symptoms
- Trouble holding a phone, book, steering wheel, or other object for a long time

- Dropping objects or having difficulty with buttons, keys, jars, or other fine hand movements
- Weakness when pinching or moving the thumb

Causes and risk factors

Carpal tunnel syndrome develops when pressure increases around the median nerve. In many people, there is no single identifiable cause. Several factors may contribute at the same time.

Conditions that can increase swelling or affect nerves include diabetes, rheumatoid arthritis, and an underactive thyroid gland. Pregnancy can cause fluid retention that raises pressure within the tunnel. Pregnancy-related symptoms often improve after delivery, although they sometimes persist and need further assessment.

A wrist fracture, dislocation, arthritis, or other change in the shape of the wrist can reduce space in the tunnel. A cyst or another mass may occasionally press on the nerve. Acute bleeding or swelling after an injury can cause symptoms to appear quickly.

People may also have a naturally smaller carpal tunnel. Carpal tunnel syndrome becomes more common with age and is diagnosed more often in women. Higher body weight is another associated factor.

Work or hobbies that involve repeated forceful gripping, exposure to vibration, or prolonged positions at the limits of wrist movement may contribute to symptoms. Repetition alone does not explain every case. Ordinary keyboard or mouse use has not been shown to be a universal direct cause, although an uncomfortable wrist position may aggravate symptoms that are already present.

Risk factors do not confirm that a person has carpal tunnel syndrome. A clinician considers the location and pattern of symptoms, the examination, and sometimes nerve testing before making a diagnosis.

Diagnosis

Diagnosis begins with a medical history. A clinician may ask which fingers are affected, when symptoms occur, whether shaking the hand helps, and whether symptoms interfere with sleep or hand function. They may also ask about injuries, pregnancy, health conditions, medicines, work, and hobbies.

During the examination, the clinician may check sensation in the fingers, thumb strength, grip,

and the muscles at the base of the thumb. The neck, shoulder, elbow, and hand may also be examined to look for other causes.

Certain examination maneuvers may briefly increase symptoms. For example, the wrist may be bent, or gentle pressure may be placed over the median nerve. These findings can support the diagnosis, but no single maneuver is accurate enough to confirm or exclude carpal tunnel syndrome on its own.

Additional tests are not needed in every straightforward case. They may be useful when the diagnosis is uncertain, symptoms are severe or unusual, weakness is present, or surgery is being considered.

Nerve conduction studies measure how quickly electrical signals travel through the median nerve. Slower movement across the wrist can support the diagnosis and help estimate severity. Electromyography, often called EMG, uses a thin needle electrode to assess electrical activity in selected muscles. It can identify muscle effects from nerve damage and help distinguish wrist compression from a problem in the neck or elsewhere.

Ultrasound can show enlargement of the median nerve or identify a cyst or other structural problem. Imaging such as an X-ray may be appropriate when a fracture or arthritis is suspected. MRI is generally not a routine test for typical carpal tunnel syndrome.

Blood tests may be considered if symptoms or medical history suggest diabetes, thyroid disease, inflammatory arthritis, or another underlying condition. These tests do not diagnose carpal tunnel syndrome itself.

Treatment and management

Treatment aims to reduce pressure on the median nerve, improve sleep and hand function, and prevent lasting nerve damage. The approach depends on symptom severity and test findings.

A wrist splint that keeps the wrist in a neutral, straight position is often used at night for mild or intermittent symptoms. Bending the wrist during sleep can increase pressure within the carpal tunnel. A splint should fit securely without being so tight that it causes swelling, color changes, or additional numbness.

Adjusting aggravating activities may also help. This can include taking short breaks from prolonged gripping, reducing exposure to vibration, changing tool handles, or arranging a workstation so the wrist stays closer to neutral. Complete avoidance of ordinary hand use is usually unnecessary. The goal is to reduce positions or forces that reliably trigger symptoms.

A corticosteroid injection into the carpal tunnel can reduce inflammation and may provide short-term relief. It may also help support the diagnosis when symptoms improve. Relief may

not last, and repeated injections are not a substitute for reassessment when numbness or weakness is progressing. Injection risks and expected benefits should be discussed with a qualified clinician.

Anti-inflammatory pain medicines may help a separate source of wrist pain, but they do not directly correct pressure on the median nerve. Oral corticosteroids may provide temporary improvement in some situations, but potential side effects and limited durability mean that they require a clinician's guidance. Treatment of diabetes, thyroid disease, inflammatory arthritis, or another contributing condition may be important, although it may not fully resolve the nerve compression.

Hand therapy may focus on education, activity changes, comfort, and maintaining movement. Evidence for specific exercises, including nerve-gliding exercises, is mixed. Exercises should not be continued if they cause lasting numbness, increased pain, or worsening weakness.

Carpal tunnel release surgery creates more room for the median nerve by cutting the ligament that forms the roof of the tunnel. It may be performed through a small open incision or with an endoscope, which uses a small camera. Both approaches can be effective.

Surgery may be considered when symptoms continue despite nonsurgical care, numbness is constant, nerve testing shows significant damage, or thumb weakness and muscle loss are developing. People with severe nerve damage may improve slowly, and full sensation or strength may not return if compression has been present for a long time.

After surgery, finger movement is usually encouraged. The incision and activity restrictions depend on the procedure and the surgeon's instructions. Temporary soreness around the scar or at the base of the palm can occur. Return to work and heavier hand use varies with healing, job demands, and the type of surgery.

Complications

Without treatment, ongoing median nerve compression can lead to constant numbness, reduced coordination, thumb weakness, and wasting of the muscles at the base of the thumb. These changes may make it difficult to pinch, grip, or handle small objects. Advanced nerve damage may not fully recover after pressure is relieved.

Carpal tunnel release is commonly performed, but it still has risks. Possible problems include infection, bleeding, scar sensitivity, palm pain, stiffness, incomplete symptom relief, or symptoms that return. Injury to a nerve or nearby structure is uncommon but can have serious effects.

Persistent symptoms after treatment do not always mean that the procedure failed. The nerve

may need time to recover, particularly after severe compression. Another condition, such as neck-related nerve compression, arthritis, or nerve damage from diabetes, may also be contributing.

Follow up

Routine follow-up is appropriate when symptoms are stable and being managed with a splint or activity changes. A clinician may review sleep disruption, numbness, hand function, splint fit, and whether further testing or treatment is needed.

Seek an earlier appointment if numbness becomes constant, symptoms spread, objects are being dropped more often, or the thumb becomes weak. Visible shrinking of the muscles at the base of the thumb also needs prompt assessment. These changes can indicate more advanced nerve compression.

After an injection or surgery, follow the treating clinician's instructions for wound care, activity, and review. Contact the care team promptly for increasing redness, warmth, drainage, fever, severe swelling, worsening weakness, or fingers that become pale, blue, or unusually cold.

Go to urgent or emergency care for rapidly developing severe pain and numbness after a wrist injury, major swelling, bleeding, or a tight cast or dressing. Sudden symptoms involving the face, speech, balance, or an entire side of the body also require emergency assessment rather than routine carpal tunnel follow-up.

Sources

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