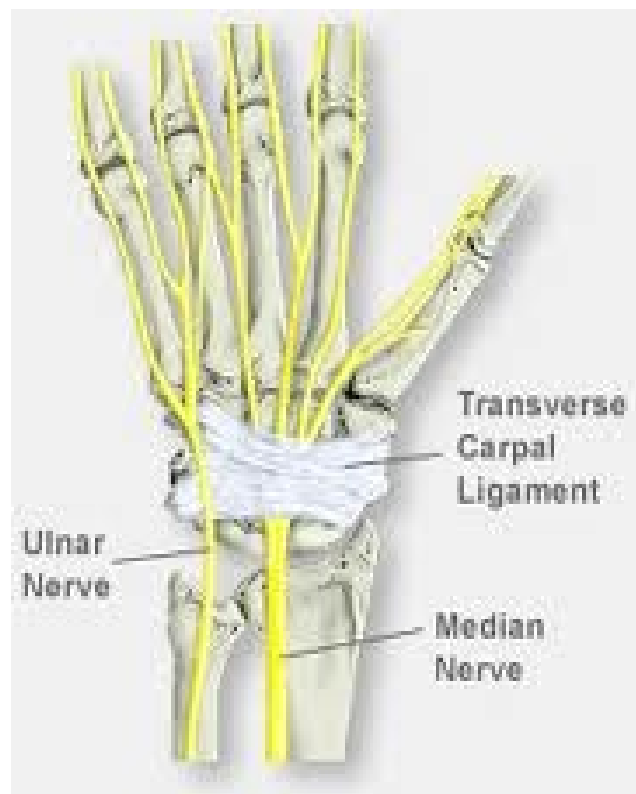


# Temple Physical Therapy

## A General Overview of Common Elbow, Hand and Wrist Injuries



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## Tennis Elbow (Lateral Epicondylitis)

Tennis elbow, or *lateral epicondylitis*, is a painful condition of the elbow caused by overuse. Not surprisingly, playing tennis or other racquet sports can cause this condition. But several other sports and activities can also put you at risk.

Tennis elbow is an inflammation of the tendons that join the forearm muscles on the outside of the elbow. The forearm muscles and tendons become damaged from overuse — repeating the same motions again and again. This leads to pain and tenderness on the outside of the elbow.

There are many treatment options for tennis elbow. In most cases, treatment involves a team approach. Primary doctors, physical therapists, and, in some cases, surgeons work together to provide the most effective care.

### Anatomy

Your elbow joint is a joint made up of three bones: your upper arm bone (humerus) and the two bones in your forearm (radius and ulna). There are bony bumps at the bottom of the humerus called epicondyles. The bony bump on the outside (lateral side) of the elbow is called the lateral epicondyle.

Muscles, ligaments, and tendons hold the elbow joint together.

Lateral epicondylitis, or tennis elbow, involves the muscles and tendons of your forearm. Your forearm muscles extend your wrist and fingers. Your forearm tendons -- often called extensors -- attach the muscles to bone. They attach on the lateral epicondyle. The tendon usually involved in tennis elbow is called the Extensor Carpi Radialis Brevis (ECRB).



*Modified from The Body Almanac. © American Academy of Orthopaedic Surgeons, 2003.*

## **Cause**

### ***Overuse***

Recent studies show that tennis elbow is often due to damage to a specific forearm muscle. The extensor carpi radialis brevis (ECRB) muscle helps stabilize the wrist when the elbow is straight. This occurs during a tennis groundstroke, for example. When the ECRB is weakened from overuse, microscopic tears form in the tendon where it attaches to the lateral epicondyle. This leads to inflammation and pain.

The ECRB may also be at increased risk for damage because of its position. As the elbow bends and straightens, the muscle rubs against bony bumps. This can cause gradual wear and tear of the muscle over time.

### ***Activities***

Athletes are not the only people who get tennis elbow. Many people with tennis elbow participate in work or recreational activities that require repetitive and vigorous use of the forearm muscle.

Painters, plumbers, and carpenters are particularly prone to developing tennis elbow. Studies have shown that auto workers, cooks, and even butchers get tennis elbow more often than the rest of the population. It is thought that the repetition and weight lifting required in these occupations leads to injury.

### ***Age***

Most people who get tennis elbow are between the ages of 30 and 50, although anyone can get tennis elbow if they have the risk factors. In racquet sports like tennis, improper stroke technique and improper equipment may be risk factors.

### ***Unknown***

Lateral epicondylitis can occur without any recognized repetitive injury. This occurrence is called "insidious" or of an unknown cause.

## Symptoms



Location of pain in lateral epicondylitis.

*Reproduced with permission from Griffen L (ed): Essentials of Musculoskeletal Care, Third Edition. © American Academy of Orthopaedic Surgeons, 2005.*

The symptoms of tennis elbow develop gradually. In most cases, the pain begins as mild and slowly worsens over weeks and months. There is usually no specific injury associated with the start of symptoms.

Common signs and symptoms of tennis elbow include:

- Pain or burning on the outer part of your elbow
- Weak grip strength

The symptoms are often worsened with forearm activity, such as holding a racquet, turning a wrench, or shaking hands. Your dominant arm is most often affected; however both arms can be affected.

## Doctor Examination

Your doctor will consider many factors in making a diagnosis. These include how your symptoms developed, any occupational risk factors, and recreational sports participation.

Your doctor will talk to you about what activities cause symptoms and where on your arm the symptoms occur. Be sure to tell your doctor if you have ever injured your elbow. If you have a history of rheumatoid arthritis or nerve disease, tell your doctor.

During the examination, your doctor will use a variety of tests to pinpoint the diagnosis. For example, your doctor may ask you to try to straighten your wrist and fingers against resistance with your arm fully straight to see if this causes pain. If the tests are positive, it tells your doctor that those muscles may not be healthy.

## Tests

Your doctor may recommend additional tests to rule out other causes of your problem.

### *X-rays*

These may be taken to rule out arthritis of the elbow.

### *Magnetic Resonance Imaging (MRI)*

If your doctor thinks your symptoms are related to a neck problem, an MRI scan may be ordered. This will help your doctor see if you have a possible herniated disk or arthritis in your neck. Both of these conditions often produce arm pain.

### *Electromyography (EMG)*

Your doctor may order an EMG to rule out nerve compression. Many nerves travel around the elbow, and the symptoms of nerve compression are similar to those of tennis elbow.

## Treatment

### *Nonsurgical Treatment*

Approximately 80% to 95% of patients have success with nonsurgical treatment.

**Rest.** The first step toward recovery is to give your arm proper rest. This means that you will have to stop participation in sports or heavy work activities for several weeks.

**Non-steroidal anti-inflammatory medicines.** Drugs like aspirin or ibuprofen reduce pain and swelling.



Wrist stretching exercise with elbow extended.

**Equipment check.** If you participate in a racquet sport, your doctor may encourage you to have your equipment checked for proper fit. Stiffer racquets and looser-strung racquets often can reduce the stress on the forearm, which means that the forearm muscles do not

have to work as hard. If you use an oversized racquet, changing to a smaller head may help prevent symptoms from recurring.

**Physical therapy.** Specific exercises are helpful for strengthening the muscles of the forearm. Your therapist may also perform ultrasound, ice massage, or muscle-stimulating techniques to improve muscle healing.

**Brace.** Using a brace centered over the back of your forearm may also help relieve symptoms of tennis elbow. This can reduce symptoms by resting the muscles and tendons.



Counterforce brace.

**Steroid injections.** Steroids, such as cortisone, are very effective anti-inflammatory medicines. Your doctor may decide to inject your damaged muscle with a steroid to relieve your symptoms.

**Extracorporeal shock wave therapy.** Shock wave therapy sends sound waves to the elbow. These sound waves create "microtrauma" that promote the body's natural healing processes. Shock wave therapy is considered experimental by many doctors, but some sources show it can be effective.

### ***Surgical Treatment***

If your symptoms do not respond after 6 to 12 months of nonsurgical treatments, your doctor may recommend surgery.

Most surgical procedures for tennis elbow involve removing diseased muscle and reattaching healthy muscle back to bone.

The right surgical approach for you will depend on a range of factors. These include the scope of your injury, your general health, and your personal needs. Talk with your doctor about the options. Discuss the results your doctor has had, and any risks associated with each procedure.

**Open surgery.** The most common approach to tennis elbow repair is open surgery. This involves making an incision over the elbow.

Open surgery is usually performed as an outpatient surgery. It rarely requires an overnight stay at the hospital.

**Arthroscopic surgery.** Tennis elbow can also be repaired using tiny instruments and small incisions. Like open surgery, this is a same-day or outpatient procedure.

**Surgical risks.** As with any surgery, there are risks with tennis elbow surgery. The most common things to consider include:

- Infection
- Nerve and blood vessel damage
- Possible prolonged rehabilitation
- Loss of strength
- Loss of flexibility
- The need for further surgery

**Rehabilitation.** Following surgery, your arm may be immobilized temporarily with a splint. About 1 week later, the sutures and splint are removed.

After the splint is removed, exercises are started to stretch the elbow and restore flexibility. Light, gradual strengthening exercises are started about 2 months after surgery.

Your doctor will tell you when you can return to athletic activity. This is usually 4 to 6 months after surgery. Tennis elbow surgery is considered successful in 80% to 90% of patients. However, it is not uncommon to see a loss of strength.

# Wrist Sprains

A sprain is an injury to a ligament. Ligaments are strong bands of connective tissue that connect one bone to another.

A wrist sprain is a common injury. There are many ligaments in the wrist that can be stretched or torn, resulting in a sprain. This occurs when the wrist is bent forcefully, such as in a fall onto an outstretched hand.

## Description

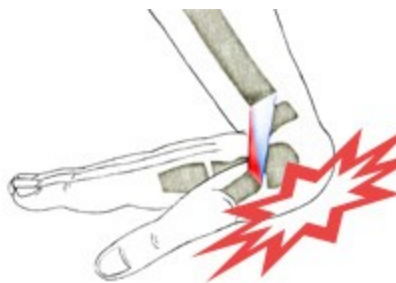


Many ligaments support the wrist.

Wrist sprains can range from mild to severe. They are graded, depending on the degree of injury to the ligaments.

- **Grade 1.** These mild sprains occur when the ligaments are stretched, but not torn.
- **Grade 2.** These moderate sprains occur when the ligaments are partially torn. Grade 2 sprains may involve some loss of function.
- **Grade 3.** These severe sprains occur when the ligament is completely torn. These are significant injuries that require medical or surgical care. As the ligament tears away from the bone, it may also take a small chip of bone with it, called an avulsion fracture.

## Cause





Wrist sprains are most often caused by a fall onto an outstretched hand. This might happen during everyday activities, but frequently occurs during sports and outdoor recreation.

## Symptoms

Symptoms of a wrist sprain may vary in intensity and location. The most common symptoms of a wrist sprain include:

- Swelling in the wrist
- Pain at the time of the injury
- Persistent pain when you move your wrist
- Bruising or discoloration of the skin around the wrist
- Tenderness at the injury site
- A feeling of popping or tearing inside the wrist
- A warm or feverish feeling to the skin around the wrist

Sometimes, a wrist injury may seem mild with very little swelling, but it could be that an important ligament has been torn that will require surgery to avoid problems later.



Similarly, an unrecognized (occult) fracture may be mistakenly considered a mild or moderately sprained wrist. If left untreated, the broken bone may not heal and will require a surgery that could have been avoided with early, appropriate treatment. The most common example of this is an occult fracture of the scaphoid bone.

It is important in all but very mild cases for a doctor to evaluate a wrist injury. Proper diagnosis and treatment of wrist injuries is necessary to avoid long-lasting stiffness and pain.

## Doctor Examination

Your doctor will discuss your medical history and any previous injuries to your hand or wrist. He or she will ask questions about how and when the current injury happened, and will review all your symptoms, including asking about any numbness in your hand.

Your doctor will examine your entire arm and hand to make sure that there are no other injuries. Tenderness in certain areas may suggest a broken bone.

Partial ligament tears are sometimes difficult to diagnose, but may cause re-occurring (chronic) disability if not treated surgically. Every effort should be made to properly diagnose the cause of persistent pain in a sprained wrist.

### ***Imaging Tests***

Your doctor may order imaging tests to help determine whether your wrist is sprained.

**X-rays.** Although they will not show an injury to the ligament, x-rays can show whether the injury is related to a broken bone.

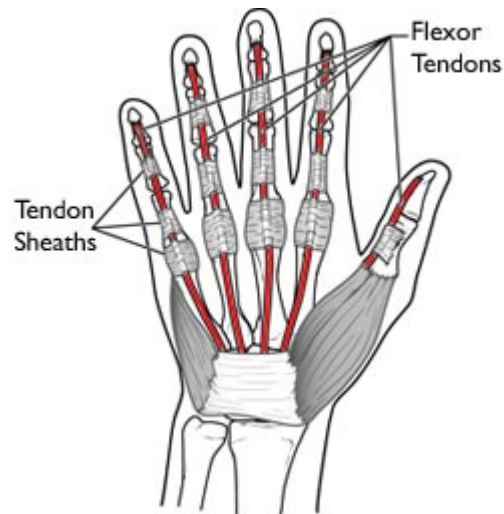
**Other tests.** In some cases, a magnetic resonance imaging (MRI) scan, computed tomography (CT) scan, or arthrogram may also be ordered. An arthrogram involves the injection of some dye into the joint. This makes the joint and ligaments show up more clearly.

# Flexor Tendon Injuries

A deep cut on the palm side of your fingers, hand, wrist, or forearm can damage your flexor tendons, which are the tissues that help control movement in your hand. A flexor tendon injury can make it impossible to bend your fingers or thumb.

## Anatomy

Tendons are tissues that connect muscles to bone. When muscles contract, tendons pull on bones. This causes parts of the body (such as a finger) to move.

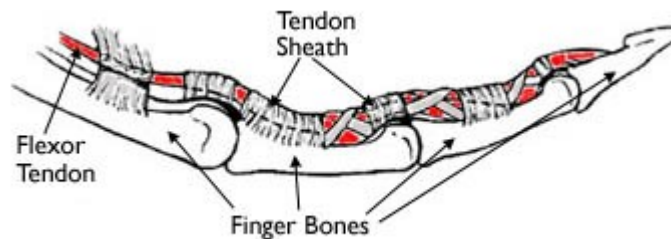


The flexor tendons allow you to bend your fingers.

The muscles that move the fingers and thumb are located in the forearm. Long tendons extend from these muscles through the wrist and attach to the small bones of the fingers and thumb.

The tendons on the top of the hand straighten the fingers. These are known as *extensor tendons*. The tendons on the palm side bend the fingers. These are known as the *flexor tendons*.

When you bend or straighten your finger, the flexor tendons slide through snug tunnels, called tendon sheaths, that keep the tendons in place next to the bones.



Tendon sheaths keep the tendons in place.

## **Description**

A torn or cut tendon in the forearm, at the wrist, in the palm, or along the finger will make it impossible to bend one or more joints in a finger.

Because flexor tendons are very close to the surface of the skin, a deep cut will most likely hit a flexor tendon. In these cases, the tendon is often cut into two pieces.

Like a rubber band, tendons are under tension as they connect the muscle to the bone. If a tendon is torn or cut, the ends of the tendon will pull far apart, making it impossible for the tendon to heal on its own.

Because the nerves to the fingers are also very close to the tendons, a cut may damage them, as well. This will result in numbness on one or both sides of the finger. If blood vessels are also cut, the finger may have no blood supply. This requires immediate surgery.

Occasionally, flexor tendons may be partially cut or torn. With a partial tendon tear, it may still be possible to bend your finger, but not completely. These types of tears can be difficult to diagnose.

## **Causes**

In addition to cuts on the arm, hand, or fingers, certain sports activities can cause flexor tendon injuries. These injuries often occur in football, wrestling, and rugby. "Jersey finger" is one of the most common of these sports injuries. It can happen when one player grabs another's jersey and a finger (usually the ring finger) gets caught and pulled. The tendon is pulled off the bone. In sports that require a lot of arm and hand strength, such as rock climbing, tendons and/or their sheaths can also be stretched or torn.

Certain health conditions (rheumatoid arthritis, for example) weaken the flexor tendons and make them more likely to tear. This can happen without warning or injury — a person may simply notice that his or her finger no longer bends, but cannot recall how it could have happened.

## **Symptoms**

The most common signs of a flexor tendon injury include:

- An open injury, such as a cut, on the palm side of your hand, often where the skin folds as the finger bends
- An inability to bend one or more joints of your finger
- Pain when your finger is bent
- Tenderness along your finger on the palm side of your hand
- Numbness in your fingertip

## **Doctor Examination**

It is important to see a doctor whenever the fingers are injured. This is especially true if your finger is jammed and you cannot bend or straighten your fingertip.

### ***First Aid***

When you have a serious cut to your hand or fingers, apply ice immediately. Tightly wrap your hand with a clean cloth or bandage to slow down the bleeding. Elevate your hand by keeping it lifted above your heart. See a doctor as soon as possible.

Your doctor may first clean and treat any wounds that are not deep. You may need a tetanus shot or antibiotics to prevent infection.

### ***Physical Examination***



These standard examination tests help your doctor determine if a tendon or nerve has been injured.

During the examination, your doctor will ask you to bend and straighten your fingers. To test your finger strength, your doctor may have you try to bend your injured finger while he or she holds the other fingers down flat. To determine whether any nerves or blood vessels have been injured, your doctor may test your hand for sensation and blood flow to the fingers.

### ***Additional Tests***

Your doctor may also order an x-ray to see if there is any damage to the bone.

## Distal Radius Fracture



Bones of the forearm include the radius and the ulna.

The radius is the larger of the two bones of the forearm. The end toward the wrist is called the distal end. A fracture of the distal radius occurs when the area of the radius near the wrist breaks.

### Cause



Distal radius fractures are very common. In fact, the radius is the most commonly broken bone in the arm. The break usually happens when a fall causes someone to land on their outstretched hands. It can also happen in a car accident, a bike accident, a skiing accident, and similar situations.

Sometimes, the other bone of the forearm (the ulna) is also broken. When this happens, it is called a distal ulna fracture.

This fracture was first described by an Irish surgeon and anatomist, Abraham Colles, in 1814; hence the name, "Colles " fracture.

### Symptoms

A broken wrist usually causes immediate (acute) pain, tenderness, bruising, and swelling. Frequently, the wrist hangs in an odd or bent way (deformity).

### Diagnosis



The doctor will take an X-ray of the wrist. This is important to understand the extent of the injury.

The fracture almost always occurs about 1 inch from the end of the bone. The break (fracture) can occur in many different ways, however.

A fracture that extends into the joint, it is called an intra-articular fracture.

A fracture that does not extend into the joint is called an extra-articular fracture. ("Articular" means "joint.")

When a fractured bone breaks the skin, it is called an open fracture.

When a bone is broken into more than two pieces, it is called a comminuted fracture.

It is important to classify the type of fracture, because some fractures are more difficult to treat than others. Intra-articular fractures (fractures within the joints), open fractures (fractures that break through the skin), and comminuted fractures (fracture that shatter the bone into a lot of small pieces) are more difficult to treat, for example.

## **Risk Factors**

Osteoporosis (decreased density of the bones) can make a relatively minor fall result in a broken wrist. Many distal radius fractures in people older than 60 years of age are caused by a fall from a standing position.

A broken wrist can happen even in healthy bones, if the force of the trauma is severe enough. For example, a car accident or a fall off a bike may generate enough force to break a wrist.

Good bone health remains an important prevention option. Wrist guards may help to prevent some fractures, but they will not prevent them all.

## **Treatment**

### ***Immediate Treatment***

If the injury is not very painful and the wrist is not deformed, it may be possible to wait until the next day. The wrist may be protected with a splint. An ice pack can be applied to the wrist and the wrist can be elevated until the doctor is able to examine it.

If the injury is very painful, if the wrist is deformed or numb or the fingers are not pink, it is necessary to go to the emergency room.

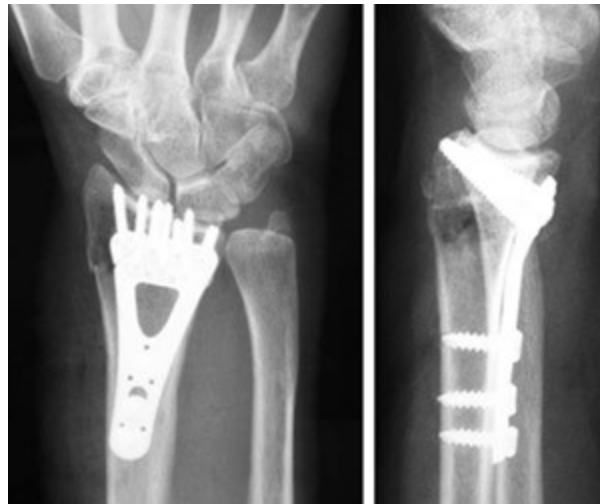
### ***Nonsurgical Treatment***

There are many treatment choices. The choice depends on many factors, such as the nature of the fracture, age and activity level, and surgeon's personal preferences. The following is a general discussion of the possible options.

**Casting:** If the broken bone is in a good position, a plaster cast may be applied until the bone heals.

If the position (alignment) of your bone is not good and likely to limit the future use of the arm, it may be necessary to correct the deformity. The bone would be re-aligned (reduced).

If the bone is straightened (reduced) without having to open the skin (incision), this is called a closed reduction.



After the bone is properly aligned, a splint or cast may be placed on your arm. A splint is usually used for the first few days, to allow for a small amount of normal swelling. A cast is usually added a few days to a week or so later, after the swelling goes down. The cast is changed two or three weeks later as the swelling goes down more, causing the cast to loosen.

X-rays may be taken, depending on the nature of the fracture. X-rays may be taken at weekly intervals for three weeks and then at six weeks if the fracture was reduced or thought to be unstable. X-rays may be taken less often if the fracture was not reduced and thought to be stable.



The cast is removed about six weeks after the fracture happened. At that point, physical therapy is often started to help improve the motion and function of the injured wrist.

### ***Surgical Treatment***



Sometimes, the position of the bone is so much out of place that it cannot be corrected or kept corrected in a cast. This has the potential of interfering with the future functioning of your arm. In this case, surgery may be required.

There are many ways of performing surgery. Even if the fracture is treated in the operating room, it may be possible to re-align (reduce) the fracture without making an incision (closed reduction). In other cases, it will be necessary to make an incision (open reduction) to directly access the broken bones to improve alignment.

Depending on the fracture, there are a number of options for holding the bone in the correct position, including a cast, metal pins (usually stainless steel or titanium), a plate and screws, an external fixator (a device for which most of the hardware remains outside of the body), or any combination of these techniques.

### **After Surgery**

#### ***What can I expect while my bone is healing?***

The kinds of distal radius fractures are so varied and the treatment options are so broad that it is hard to generalize what to expect.

Most fractures hurt moderately for a few days to a couple of weeks. Many patients find that using ice, elevation (holding their arm up above their heart), and simple, non-prescription medications for pain relief are all that are needed.

One combination is ibuprofen plus acetaminophen ("non-aspirin pain reliever"). The combination of both ibuprofen plus acetaminophen is much more effective than either one alone. If pain is severe, patients may need to take a prescription strength medication, often a narcotic, for a few days.

Casts and splints must be kept dry. A plastic bag over the arm while showering should help. If the cast does become wet, it will not dry very easily. A hair dryer on the cool setting may be helpful.

Most surgical incisions must be kept clean and dry for five days or until the sutures (stitches) are removed, whichever occurs later.

***What can I expect after my bone has healed?***

Most patients do return to all their former activities. The nature of the injury, the kind of treatment received, and the body's response to the treatment all have an impact, so the answer is different for each individual.

Some generalizations can be made.

- The cast is usually removed at about six weeks.
- Most patients will start physical therapy, if their doctor feels it is needed, within a few days to weeks after surgery, or right after the last cast is taken off.
- Most patients will be able to resume light activities, such as swimming or exercising the lower body in the gym, within a month or two after the cast is taken off or after within a month or two after surgery.
- Most patients can resume vigorous physical activities, such as skiing or football, between three and six months after the injury.
- Almost all patients will have some stiffness in the wrist, which will generally lessen in the month or two after the cast is taken off or after surgery. Improvement will continue for at least two years.
- Recovery should be expected to take at least a year. Some pain with vigorous activities may be expected for about that long. Some residual stiffness or ache is to be expected for two years or possibly permanently, especially for high-energy injuries (such as motorcycle crashes, etc), in patients older than 50 years of age, or in patients who have some osteoarthritis. However, the stiffness is usually minor and may not affect the overall function of the arm.

Remember, these are general guidelines and may not apply to you and your fracture. Ask your doctor for specifics in your case. Your doctor knows that returning to activities is important to you.

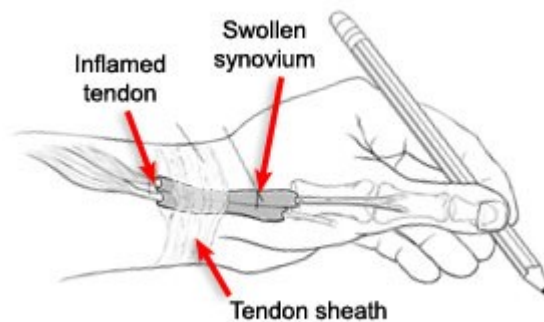
Finally, osteoporosis is a factor in as many as 250,000 wrist fractures. It has been suggested that people who suffer a wrist fracture may need to be screened for osteoporosis, especially if they have other risk factors. Ask your doctor if you need to be screened or treated for osteoporosis.

# De Quervain's Tendinitis (De Quervain's Tendinosis)

De Quervain's tendinitis occurs when the tendons around the base of the thumb are irritated or constricted. The word "tendinitis" refers to a swelling of the tendons. Thickening of the tendons can cause pain and tenderness along the thumb side of the wrist. This is particularly noticeable when forming a fist, grasping or gripping things, or when turning the wrist.

## Anatomy

Two of the main tendons to the thumb pass through a tunnel (or series of pulleys) located on the thumb side of the wrist. Tendons are rope-like structures that attach muscle to bone. Tendons are covered by a slippery thin soft-tissue layer, called synovium. This layer allows the tendons to slide easily through the tunnel. Any swelling of the tendons located near these nerves can put pressure on the nerves. This can cause wrist pain or numbness in the fingers.



De Quervain tenosynovitis of the first extensor compartment.

*Reproduced with permission from: Griffin LY (ed): Essentials of Musculoskeletal Care, 3rd Edition. Rosemont, IL. American Academy of Orthopaedic Surgeons, 2005.*

## Causes

De Quervain's tendinitis is caused when tendons on the thumb side of the wrist are swollen or irritated. The irritation causes the lining (synovium) around the tendon to swell, which changes the shape of the compartment. This makes it difficult for the tendons to move as they should.

Tendinitis may be caused by overuse. It can be seen in association with pregnancy. It may be found in inflammatory arthritis, such as rheumatoid disease. De Quervain's tendinitis is usually most common in middle-aged women.

## Symptoms

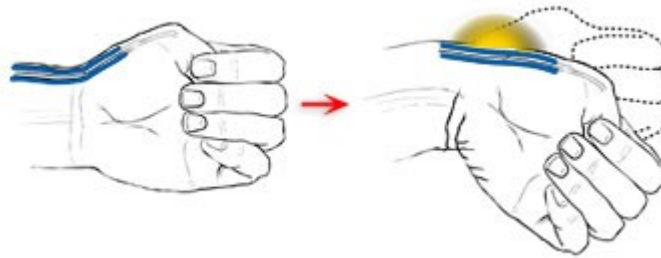
Signs of De Quervain's tendinitis:

- Pain may be felt over the thumb side of the wrist. This is the main symptom. The pain may appear either gradually or suddenly. Pain is felt in the wrist and can

- travel up the forearm. The pain is usually worse when the hand and thumb are in use. This is especially true when forcefully grasping objects or twisting the wrist.
- Swelling may be seen over the thumb side of the wrist. This swelling may occur together with a fluid-filled cyst in this region.
  - A "catching" or "snapping" sensation may be felt when moving the thumb.
  - Pain and swelling may make it difficult to move the thumb and wrist.
  - Numbness may be experienced on the back of the thumb and index finger. This is caused as the nerve lying on top of the tendon sheath is irritated.

## Diagnosis

The Finkelstein test is conducted by making a fist with the fingers closed over the thumb and the wrist is bent toward the little finger.



Finkelstein test. Arrow indicates location of pain when test is positive.

*Adapted with permission from the American Society for Surgery of the Hand: Brochure: de Quervain's Stenosing Tenosynovitis. Engelwood, CO, 1995.*

The Finkelstein test can be quite painful for the person with De Quervain's tendinitis.

Tenderness directly over the tendons on the thumb side of the wrist is a common finding with this test.

## Treatment

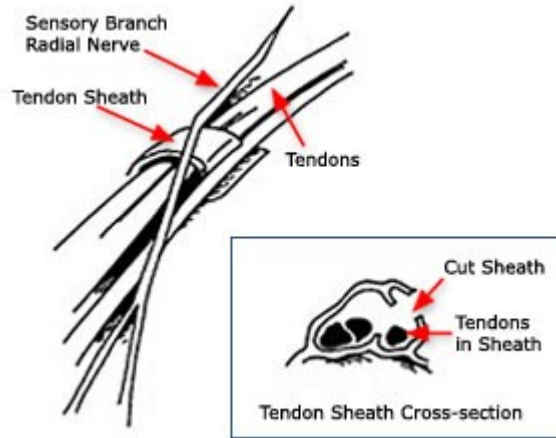
The goal in treating de Quervain's tendinitis is to relieve the pain caused by irritation and swelling.

### *Nonsurgical Treatment*

- **Splints.** Splints may be used to rest the thumb and wrist.
- **Anti-inflammatory medication (NSAIDs).** These medications can be taken by mouth or injected into that tendon compartment. They may help reduce the swelling and relieve the pain.
- **Avoiding activities that cause pain and swelling.** This may allow the symptoms to go away on their own.
- **Corticosteroids.** Injection of corticosteroids into the tendon sheath may help reduce swelling and pain.

### *Surgical Treatment*

Surgery may be recommended if symptoms are severe or do not improve. The goal of surgery is to open the compartment (covering) to make more room for the irritated tendons.



Surgery opens the sheath over the inflamed tendons.

Normal use of the hand usually can be resumed once comfort and strength have returned. Your orthopaedic surgeon can advise you on the best treatment for your situation.

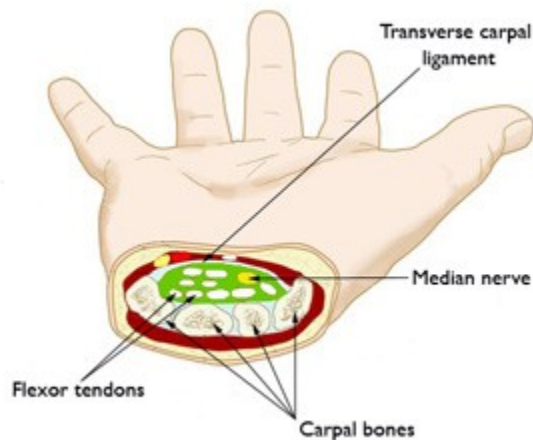
# Carpal Tunnel Syndrome

Carpal tunnel syndrome is a common source of hand numbness and pain. It is more common in women than men.

## Anatomy

The carpal tunnel is a narrow, tunnel-like structure in the wrist. The bottom and sides of this tunnel are formed by wrist (carpal) bones. The top of the tunnel is covered by a strong band of connective tissue called the transverse carpal ligament.

The median nerve travels from the forearm into the hand through this tunnel in the wrist. The median nerve controls feeling in the palm side of the thumb, index finger, and long fingers. The nerve also controls the muscles around the base of the thumb. The tendons that bend the fingers and thumb also travel through the carpal tunnel. These tendons are called flexor tendons.

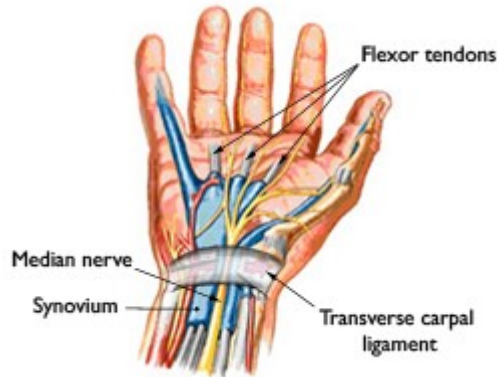


The carpal tunnel protects the median nerve and flexor tendons that bend the fingers and thumb.  
*Reproduced and adapted from Rodner C, Raissis A, Akelman E: Carpal Tunnel Syndrome. Orthopaedic Knowledge Online. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2009.*

## Cause

Carpal tunnel syndrome occurs when the tissues surrounding the flexor tendons in the wrist swell and put pressure on the median nerve. These tissues are called the synovium. The synovium lubricates the tendons and makes it easier to move the fingers.

This swelling of the synovium narrows the confined space of the carpal tunnel, and over time, crowds the nerve.



Carpal tunnel syndrome is caused by pressure on the median nerve traveling through the carpal tunnel.

Many things contribute to the development of carpal tunnel syndrome:

- Heredity is the most important factor - carpal tunnels are smaller in some people, and this trait can run in families.
- Hand use over time can play a role.
- Hormonal changes related to pregnancy can play a role.
- Age — the disease occurs more frequently in older people.
- Medical conditions, including diabetes, rheumatoid arthritis, and thyroid gland imbalance can play a role.

In most cases of carpal tunnel syndrome, there is no single cause.

## Symptoms

The most common symptoms of carpal tunnel syndrome include:

- Numbness, tingling, and pain in the hand
- An electric shock-like feeling mostly in the thumb, index, and long fingers
- Strange sensations and pain traveling up the arm toward the shoulder

Symptoms usually begin gradually, without a specific injury. In most people, symptoms are more severe on the thumb side of the hand.

Symptoms may occur at any time. Because many people sleep with their wrists curled, symptoms at night are common and may awaken you from sleep. During the day, symptoms frequently occur when holding something, like a phone, or when reading or driving. Moving or shaking the hands often helps decrease symptoms.

Symptoms initially come and go, but over time they may become constant. A feeling of clumsiness or weakness can make delicate motions, like buttoning your shirt, difficult. These feelings may cause you to drop things. If the condition is very severe, muscles at the base of the thumb may become visibly wasted.

## Doctor Examination

To determine whether you have carpal tunnel syndrome, your doctor will discuss your symptoms and medical history. He or she will also examine your hand and perform a number of physical tests, such as:

- Checking for weakness in the muscles around the base of your thumb
- Bending and holding your wrists in positions to test for numbness or tingling in your hands
- Pressing down on the median nerve in the wrist to see if it causes any numbness or tingling
- Tapping along the median nerve in the wrist to see whether tingling is produced in any of the fingers
- Testing the feeling in your fingers by lightly touching them when your eyes are closed

## Tests

**Electrophysiological tests.** Electrical testing of median nerve function is often done to help confirm the diagnosis and clarify the best treatment option in your case.

**X-rays.** If you have limited wrist motion, your doctor may order x-rays of your wrist.

## Treatment

For most people, carpal tunnel syndrome will progressively worsen without some form of treatment. It may, however, be modified or stopped in the early stages. For example, if symptoms are clearly related to an activity or occupation, the condition may not progress if the occupation or activity is stopped or modified.

### *Nonsurgical Treatment*

If diagnosed and treated early, carpal tunnel syndrome can be relieved without surgery. In cases where the diagnosis is uncertain or the condition is mild to moderate, your doctor will always try simple treatment measures first.

**Bracing or splinting.** A brace or splint worn at night keeps the wrist in a neutral position. This prevents the nightly irritation to the median nerve that occurs when wrists are curled during sleep. Splints can also be worn during activities that aggravate symptoms.

**Medications.** Simple medications can help relieve pain. These medications include anti-inflammatory drugs (NSAIDs), such as ibuprofen.

**Activity changes.** Changing patterns of hand use to avoid positions and activities that aggravate the symptoms may be helpful. If work requirements cause symptoms, changing or modifying jobs may slow or stop progression of the disease.

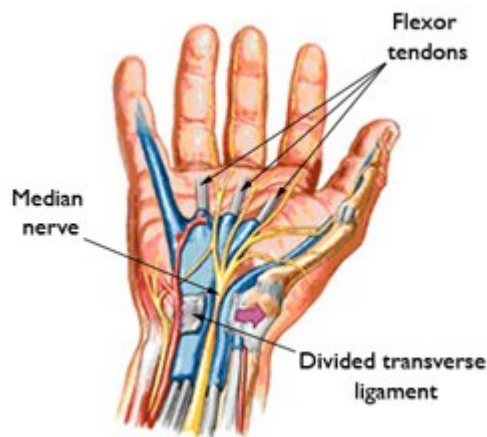


**Steroid injections.** A corticosteroid injection will often provide relief, but symptoms may come back.

### ***Surgical Treatment***

Surgery may be considered if you do not gain relief from nonsurgical treatments. The decision whether to have surgery is based mostly on the severity of your symptoms.

- In more severe cases, surgery is considered sooner because other nonsurgical treatment options are unlikely to help.
- In very severe, long-standing cases with constant numbness and wasting of your thumb muscles, surgery may be recommended to prevent irreversible damage.



The ligament is cut during surgery. When it heals, there is more room for the nerve and tendons.

**Surgical technique.** In most cases, carpal tunnel surgery is done on an outpatient basis under local anesthesia.

During surgery, a cut is made in your palm. The roof (transverse carpal ligament) of the carpal tunnel is divided. This increases the size of the tunnel and decreases pressure on the nerve.

Once the skin is closed, the ligament begins to heal and grow across the division. The new growth heals the ligament, and allows more space for the nerve and flexor tendons.

**Endoscopic method.** Some surgeons make a smaller skin incision and use a small camera, called an endoscope, to cut the ligament from the inside of the carpal tunnel. This may speed up recovery.

The end results of traditional and endoscopic procedures are the same. Your doctor will discuss the surgical procedure that best meets your needs.

**Recovery.** Right after surgery, you will be instructed to frequently elevate your hand above your heart and move your fingers. This reduces swelling and prevents stiffness.

Some pain, swelling, and stiffness can be expected after surgery. You may be required to wear a wrist brace for up to 3 weeks. You may use your hand normally, taking care to avoid significant discomfort.

Minor soreness in the palm is common for several months after surgery. Weakness of pinch and grip may persist for up to 6 months.

Driving, self-care activities, and light lifting and gripping may be permitted soon after surgery. Your doctor will determine when you should return to work and whether there should be any restrictions on your work activities.

**Complications.** The most common risks from surgery for carpal tunnel syndrome include:

- Bleeding
- Infection
- Nerve injury

**Long-term outcomes.** Most patients' symptoms improve after surgery, but recovery may be gradual. On average, grip and pinch strength return by about 2 months after surgery.

Complete recovery may take up to a year. If significant pain and weakness continue for more than 2 months, your physician may instruct you to work with a hand therapist.

In long-standing carpal tunnel syndrome, with severe loss of feeling and/or muscle wasting around the base of your thumb, recovery is slower and might not be complete.

Carpal tunnel syndrome can occasionally recur and may require additional surgery.

# Arthritis of the Wrist

Arthritis affects millions of people in the United States. Often, arthritis strikes at the weightbearing joints of the body, such as the knees and the shoulders. A significant number of people suffer from arthritis in their wrists and hands, which makes it difficult for them to perform the activities of daily living.

## Cause

Although there are hundreds of kinds of arthritis, most wrist pain is caused by just two types:

### Osteoarthritis

Osteoarthritis (OA) is a progressive condition that destroys the smooth articular cartilage covering the ends of bones. The bare bones rub against each other, resulting in pain, stiffness, and weakness. Osteoarthritis can develop due to normal "wear-and-tear" on the wrist or as a result of a traumatic injury to the forearm, wrist, or ligaments.

### Rheumatoid Arthritis

Rheumatoid arthritis (RA) is a systemic inflammatory disease that affects the joint linings and destroys bones, tissues, and joints. Rheumatoid arthritis often starts in smaller joints, like those found in the hand and wrist. It is symmetrical, meaning that it usually affects the same joint on both sides of the body.

## Symptoms

OA of the wrist joint manifests with swelling, pain, limited motion, and weakness. These symptoms are usually limited to the wrist joint itself.

RA of the wrist joint usually manifests with swelling, tenderness, limited motion, and decreased grip strength. In addition, hand function may be impaired and there may be pain in the knuckle joints (metacarpophalangeal, or MP, joint).

Joint swelling may also put pressure on the nerves that travel through the wrist. This can cause a lesion to develop (compression neuropathy) or it can lead to carpal tunnel syndrome.

## Diagnosis

The bones that make up the wrist joint include the two bones of the lower arm (the radius and the ulna) and four wrist bones (the carpals). Your physician will use a combination of physical examination, patient history, and tests to diagnose arthritis of the wrist. X-rays can help distinguish among various forms of arthritis. Some, but not all, forms of rheumatoid arthritis can be confirmed by a laboratory blood test.

## **Treatment**

### ***Nonsurgical Treatment***

In general, early treatment is nonsurgical and designed to help relieve pain and swelling.

Several therapies can be used to treat arthritis, including:

- Modifying your activities.
- Immobilizing the wrist for a short time in a splint.
- Taking anti-inflammatory medications such as aspirin or ibuprofen.
- Following a prescribed exercise program.
- Getting a steroid injection into the joint.

Your physician may prescribe other therapies, depending on the type of arthritis you have. For example, additional therapies for patients with rheumatoid arthritis include antimalarial drugs, antimetabolites, gold, immunosuppressive drugs (both non-steroidal and corticosteroids).

### ***Surgical Treatment***

When nonsurgical methods are no longer effective, or if hand function decreases, surgery is an option. The goal of surgery is to relieve pain. Depending on the type of surgery, joint function may also be affected.

Surgical options include:

- Removing the arthritic bones
- Joint fusion (making the joint solid and preventing any movement at the wrist)
- Joint replacement

You and your physician should discuss the options and select the one that is best for you.