

# MUSCULOSKELETAL DISORDERS AND PREVENTION



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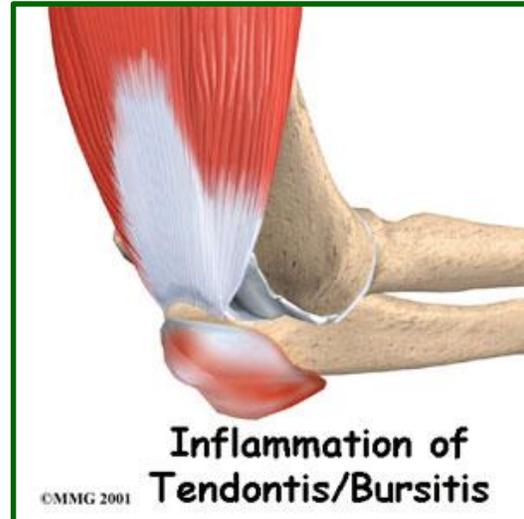
# Tendonitis

## Definition:

Tendonitis describes inflammation, swelling, and irritation of a tendon.

## Cause:

Tendonitis can result from several different etiologies. Overuse of the tendon during work or with activities is the most common cause of tendonitis. People who work on an assembly line are often prone to developing tendonitis due to the repetitive nature of their job. Tennis and golf are two activities that commonly cause tendonitis of the elbow due to the repetitive motion at the elbow. Direct injury to the tendon can also result in tendonitis as can various inflammatory conditions, such as rheumatoid arthritis. Lastly, aging can make one more prone to developing tendonitis. As we age our tendons lose their elasticity, making them more susceptible to irritation and inflammation.



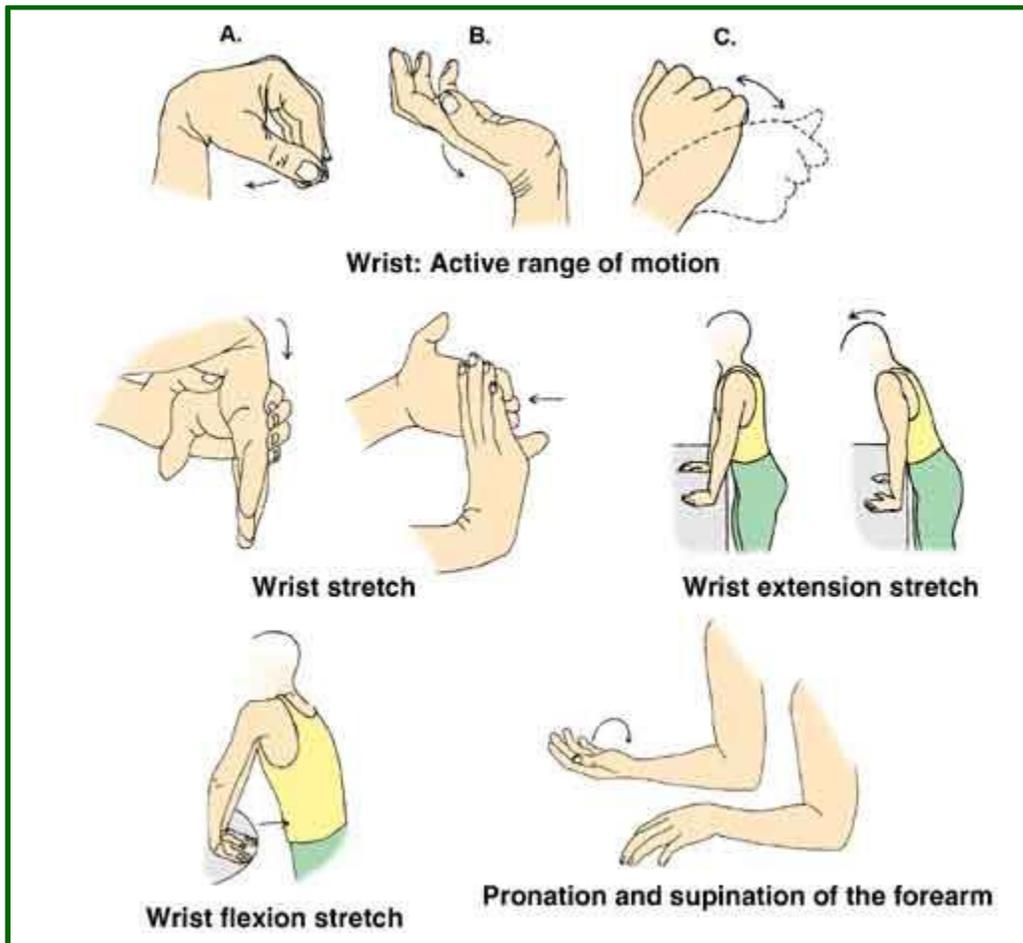
## Symptoms:

- Tenderness- with pressure on the tendon.
- Pain- when moving the affected tendon.
- Stiffness- experienced after resting the tendon.

## Treatment:

Treatment of tendonitis involves resting the effected tendon and decreasing inflammation. Resting the effected tendon through avoidance of increased activity or even immobilizing the area is the first mode of treatment. Steroid injections provided by your physician or nonsteroidal anti-inflammatory medications can directly decrease inflammation and pain associated with tendonitis. Physical therapy to gently stretch and strengthen the effected tendon is vital to recovering and preventing future tendonitis episodes.

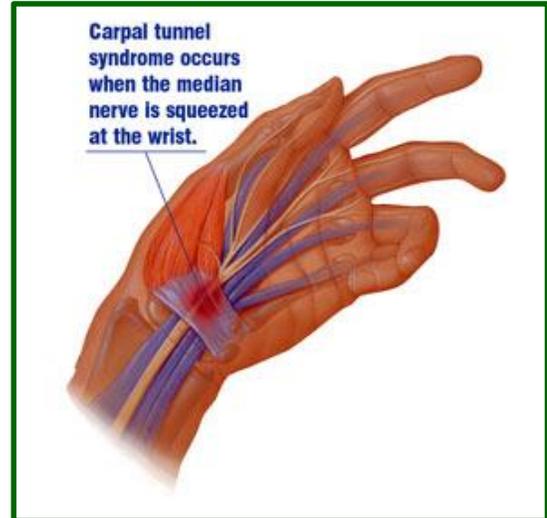
# Exercises



# Carpal Tunnel Syndrome

## Overview:

The median nerve originates from cervical spinal nerves and controls movement and sensation to the palmer side of the hand, thumb, and fingers. The carpal tunnel, a narrow passageway in the wrist, is formed by bones on the bottom and sides and a ligament which composes the top of the tunnel. The tunnel also contains nine tendons that are connected to the bones and muscles of the hand. Under various circumstances these tendons may swell and enlarge causing compression of the median nerve against the ligamentous roof which results in the symptoms experienced in carpal tunnel syndrome.



## Definition:

Carpal tunnel syndrome occurs when the median nerve is compressed at the wrist.

## Cause:

Carpal tunnel syndrome is caused by conditions and activities that put pressure on the median nerve and decrease its blood supply, leading to tingling, numbness, pain, and/or weakness.

### Activities or conditions that may cause CPS

- Hypothyroidism and rheumatoid arthritis
- Wrist injuries, bone spurs, or swelling of the tendon sheath
- Diabetes
- Smoking and obesity

## Symptoms:

Numbness and a “pins and needles” sensation are the most common symptoms experienced in carpal tunnel syndrome. Most often the thumb, index, and middle fingers are involved. Symptoms can include tingling, numbness, weakness, or pain in the fingers, thumb, hand, and occasionally in the arm. These symptoms occur when there is pressure on the median nerve within the wrist. If your little finger is not affected, this may be a sign that the condition is carpal tunnel syndrome, because the little finger is usually controlled by a different nerve than the thumb and other fingers. You may first notice symptoms at night, and you may be able to get relief by shaking your hand.

## **Treatments:**

In general, all patients with carpal tunnel syndrome should avoid repetitive motions of the wrist and hand. Ergonomic measures to relieve symptoms at work should be taken. Applying a splint to immobilize the wrist in a neutral position is another effective, noninvasive treatment for carpal tunnel syndrome. For those requiring additional treatment oral medicines such as nonsteroidal anti-inflammatory drugs, diuretics, and corticosteroids are available. Additionally a local injection of corticosteroids can be performed which will relieve the pressure on the median nerve and provide temporary relief. If these treatments don't help, surgery is the only remaining option, and an occupational physician should be contacted.

## **Prevention:**

When setting up your work area:

- Center your work in front of you, as low as possible without touching your legs (your forearms are parallel to the floor or slightly lowered). If you work while standing, have your work surface at about waist height.
- Keep your hands and wrists in line with your forearms. If you work at a keyboard, tilt it to help keep this alignment.
- Hold your elbows close to your sides.
- Avoid leaning on the heel of your hand or your wrist, especially while your wrists are bent.
- Take microbreaks every 10 to 15 minutes. Use a reminder alarm if necessary.
- Do stretching exercises every 20 to 60 minutes

Call your health professional if you:

- Have tingling, numbness, weakness, or pain in your fingers or hand that has not gone away after 2 weeks of home treatment.
- Have gradually developed little or no feeling in your fingers or hand. (If you notice sudden loss of feeling in your arm, call 911 or go to an emergency room immediately.)
- Cannot do simple hand movements, or you accidentally drop things.
- Cannot pinch your thumb and index finger together, or your pinch is weak.
- Cannot use your thumb normally (diminished thumb strength).
- Have problems at work because of pain in your fingers or hand.

# Exercises

## Fist Extension Exercises



The tendons in the wrist need to glide freely as the wrist and the fingers move. These are three different exercises to help the tendons in the wrist glide more easily...



Start with the fingers in the straight position and then move the fingers into the hook fist position. Hold this position for five seconds, then relax. Repeat four more times. Repeat the same series for the straight fist and the full fist positions.

# De Quervains

## Overview:

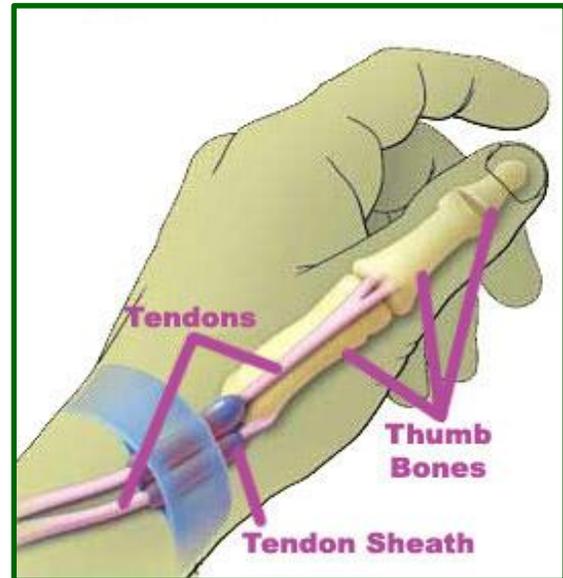
De Quervain's disease, an inflammatory disorder that can be caused by cumulative trauma, is one of the most commonly diagnosed problems seen by hand surgeons.

## Definition:

De Quervain's disease is a painful inflammation of tendons in the thumb. The swollen tendons and their coverings rub against the narrow tunnel through which they pass. The result is pain at the base of the thumb.

## Cause:

Often, the cause is unknown, but overuse, a direct blow to the thumb, repetitive grasping, and certain inflammatory conditions such as rheumatoid arthritis can all trigger the disease. Gardening, racquet sports, and various workplace tasks may also aggravate the condition.



## Symptoms:

Pain along the back of the thumb, directly over the two thumb tendons visible when the thumb is extended, is common in De Quervain's. The condition can occur gradually or suddenly; in either case, the pain may travel into the thumb or up the forearm. Thumb motion may be difficult and painful, particularly when pinching or grasping objects. Some people also experience swelling and pain on the side of the wrist at the base of the thumb. The pain may increase with thumb and wrist motion. Some people feel pain if direct pressure is applied to the area.

## Treatment:

Treatment usually involves wearing a splint 24 hours a day for four to six weeks to immobilize the affected area and refraining from any activities that aggravate the condition. Ice may be applied to reduce inflammation. If symptoms continue, your doctor may give you anti-inflammatory medication such as naproxen or ibuprofen or may inject the area with steroids to decrease pain and swelling. If De Quervain's disease does not respond to conservative medical treatment, surgery may be recommended.

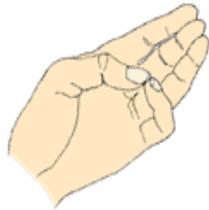
## **Prevention:**

Avoiding activities that overuse your thumb or wrist may prevent De Quervain's tenosynovitis.

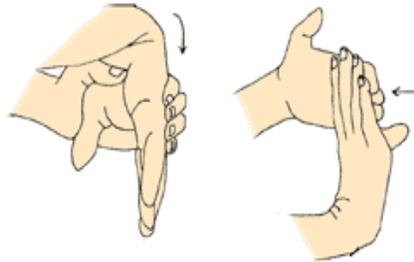
## **Home Exercises:**

- FINGER SPRING - Place a large rubber band around the outside of your thumb and the rest of your fingers. Open your fingers to stretch the rubber band. Repeat 10 to 20 times.
- WRIST ROCK STRETCH - Hold your injured hand out in front of you in the handshake position. Make a fist with your injured hand, but tuck your thumb inside your palm. Move your wrist down, hold for 5 seconds, then move your wrist up and hold for 5 seconds. Repeat 10 to 12 times.
- OPPOSITION STRETCH - Rest your injured hand on a table, palm up. Touch the tip of your thumb to the tip of your little finger. Hold this position for 6 seconds. Repeat 10 to 12 times.

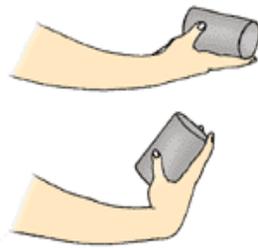
## De Quervain's Tenosynovitis Exercises



Opposition stretch



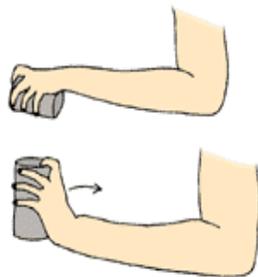
Wrist stretch



Wrist flexion exercise



Wrist radial deviation strengthening



Wrist extension exercise



Palm-down curl



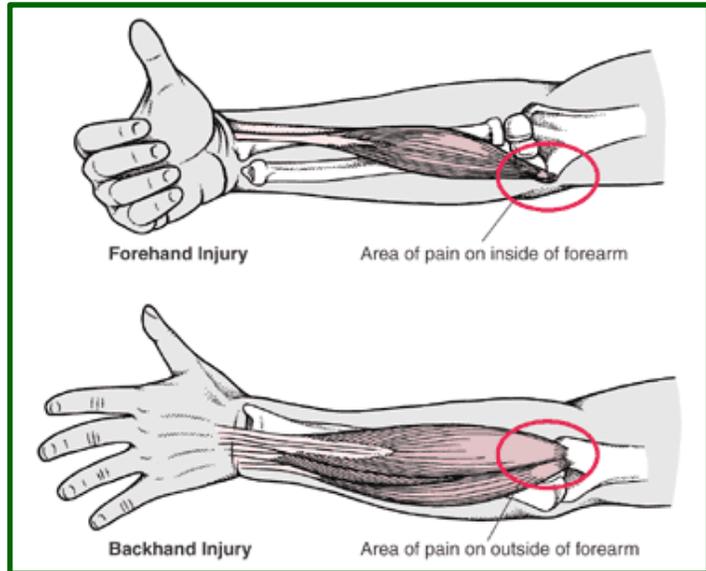
Finger spring

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# Epicondylitis

## Overview:

Epicondylitis is a tendonitis also known as tennis elbow although the majority of people with lateral epicondylitis have never played tennis. The condition causes pain on the outside portion of the elbow over a bony prominence termed the lateral epicondyle. Pain occurs with activities such as grasping, pushing, pulling and lifting. As the process progresses the pain may occur with limited activities or even at rest.



## Definition:

Painful inflammation of the muscles and soft tissues around an epicondyle.

## Cause:

Epicondylitis is most often related to overuse. Any activity that over-stresses the involved tendon, known as the extensor carpi radialis brevis, can cause the disorder. These activities include repetitive work, gardening, tennis, and golf. Of note, a separate condition termed golfer's elbow or medial epicondylitis causes pain on the inside of the elbow. Lateral epicondylitis can also be related to direct trauma to the outside portion of the elbow. It is believed that overuse or trauma causes a microscopic tear in the origin of the extensor carpi radialis brevis muscle. Although lateral epicondylitis is termed a tendonitis there are few inflammatory changes in the tissue and therefore it is considered more of a mechanical problem with degeneration of the tendon.

## Symptoms:

The phrase "epicondylitis symptoms" usually refers to aspects of the condition that can be observed by a patient, the phrase "epicondylitis signs" refers to those aspects only noticeable by a doctor.

- Elbow stiffness
- Elbow pain

## **Treatment:**

Epicondylitis is treated with a staged exercise program and often requires a therapist. The initial phase involves rest of the extremity until the acute pain improves. Nonsteroidal anti-inflammatory medications such as aspirin or ibuprofen may be helpful. The second phase includes a stretching program. The stretching exercises are focused on stretching the wrist extensor muscles. The exercises are first performed with the elbow held in flexion and later with the elbow extended. In the third phase strengthening exercises are performed. If pain develops while performing the exercises, one reverts to the prior stage. In addition to the staged program a corticosteroid injection or other therapy modalities may be helpful. Activity modification is one of the most important factors. It is recommended that activities that aggravate the symptoms are limited. Lifting should be performed with the palms turned upward (supinated). Frequent breaks from repetitive activities should be taken along with stretching before and after activities.

## **Home exercises:**

Always perform some general warm-up activity or, ideally, warm the elbow directly with a heating pad before beginning the stretching and strengthening exercises. Initially, stretch the muscles of the forearm twice per day. When stretching exercises have successfully restored normal range of motion and produced no pain, it's time to introduce strength training of the pronator muscles of the forearm. You can best do this with a large sledgehammer or weighted stick. It's important to progress slowly and to cut back at the first sign of pain. Begin with light resistance, and progressively increase the workload over the course of a few weeks. Do two or three sets per arm, three or four days per week.

## **When to Call a Doctor:**

Call your health professional immediately if you had an injury to your elbow and:

- You have severe elbow pain.
- You cannot move your elbow normally.
- Your elbow looks deformed.
- Your elbow begins to swell within 30 minutes of the injury.
- You have signs of damage to the nerves or blood vessels. These include:
  - Numbness, tingling, or a "pins and needles" sensation below the injury.
  - Pale or bluish skin.
  - The injured arm feeling colder to the touch than the uninjured one.

Call your health professional if you have:

- Pain when grasping, twisting, or lifting objects.
- Work-related problems caused by your elbow pain.
- Elbow soreness or pain after 2 weeks of home treatment, or if treatment is worsening your elbow pain.

# Exercises

## Lateral Epicondylitis (Tennis Elbow) Exercises

**Wrist range of motion**

**Wrist stretch**

**Pronation and supination of the forearm**

**Elbow range of motion**

**Wrist flexion exercise**

**Wrist extension exercise**

**Wrist radial deviation strengthening**

**Forearm pronation and supination strengthening**

**Wrist extension (with broom handle)**

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# Trigger Finger

## **Overview:**

Trigger finger is a painful condition caused by a narrowing of the sheath that surrounds the finger tendon. Inflammation due to overuse is usually the cause. It is more common in musicians, gardeners and construction workers whose work or hobbies require repetitive gripping actions. The condition is usually evaluated by an orthopedic surgeon specializing in the hand. Trigger finger commonly affects the middle or ring fingers and occasionally the thumb. The affected finger may seem stiff and "click" when moved. It catches in a bent position and straightens with a snap. There may be a bump or tenderness in the palm at the base of the finger -- the spot where the tendon most likely is catching. In severe cases, the affected finger locks in a bent position.



## **Cause:**

Inflammation due to overuse is usually the cause. Much like the disorder sounds, use of a tool with a trigger repeatedly or tools which do not have adequate padding on the trigger may be risk factors.

## **Symptoms:**

One of the first symptoms may be soreness at the base of the finger or thumb. The most common symptom is a painful clicking or snapping when attempting to flex or extend the affected finger. This catching sensation tends to worsen after periods of inactivity and loosen up with movement. In some cases, the finger or thumb that is affected locks in a flexed position or in an extended position as the condition becomes more severe, and must be gently straightened with the other hand. Joint contraction or stiffening may eventually occur.

## **Treatment:**

The first step to recovery is to limit activities that aggravate the condition. Occasionally, your doctor may put a splint on the affected hand to restrict the joint movement. If symptoms continue, anti-inflammatory medications such as ibuprofen or naproxen may be prescribed. Your doctor may also recommend an injection of a steroid medication into the tendon sheath. If the condition does not respond to conservative measures or consistently recurs, surgery may be recommended to release the tendon sheath and restore movement.

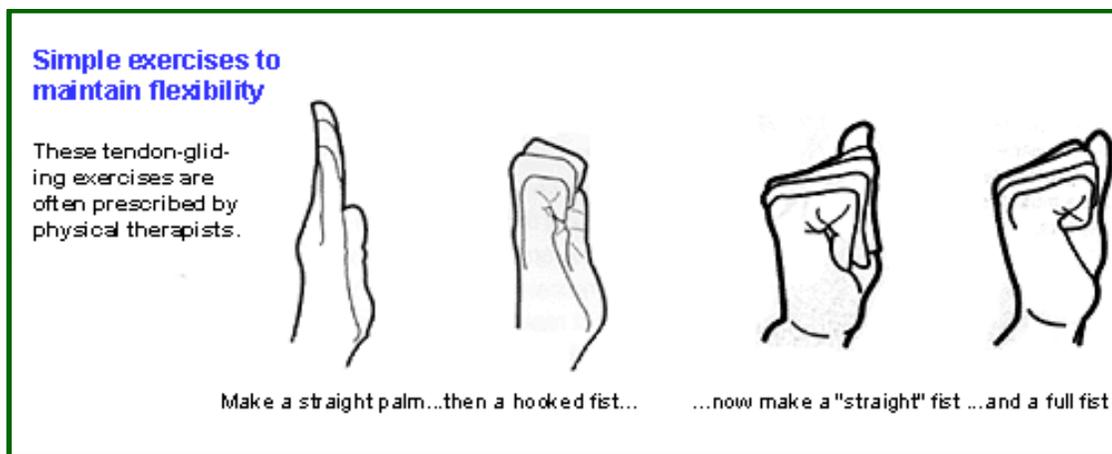
### Initial treatment includes:

- Avoiding activities that aggravate the problem
- Resting the injured area
- Icing the area the day of the injury
- Taking over-the-counter anti-inflammatory medicines

If the condition does not improve in a week, see your doctor. You may need more advanced treatments, including:

- **Corticosteroid injections.** Corticosteroids (often called "steroids") are often used because they work quickly to decrease the inflammation and pain.
- **Physical therapy.** This can be very beneficial, especially for a "frozen shoulder." Physical therapy includes range of motion exercises and splinting (thumb, forearm, and bands).
- **Surgery.** This is only rarely needed for severe problems not responding to other treatments.

## Exercises



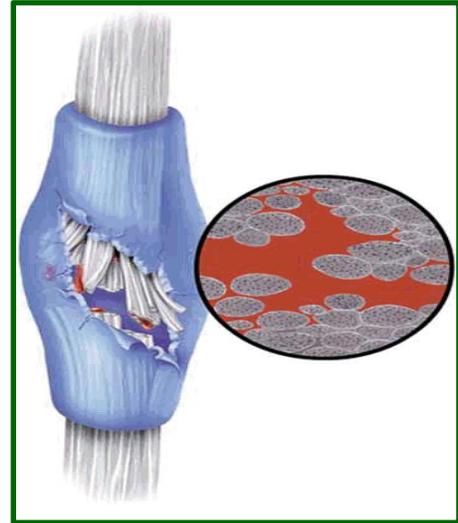
# Muscle Strain

## Definition:

Muscle strain or muscle pull or even a muscle tear implies damage to a muscle or its attaching tendons. This can occur during the course of normal daily activities, with sudden, quick heavy lifting, during sports, or while performing work tasks.

## Cause:

Most muscle strains (pulled muscles) are caused by overstretching muscles. Strains may be minor or severe, such as a torn muscle or tendon.



## Symptoms:

Symptoms of a muscle strain can vary depending on how severe the strain is and may include:

- Pain and tenderness that is worse with movement.
- Swelling and bruising.
- Normal or limited muscle movement.
- A bulge or deformity at the site of a complete tear.

## When to Call a Doctor:

If you have tried the home treatment suggestions but your pain and discomfort have lasted for several days (for example, 7 continuous days), call your doctor.

## Home Treatment:

Recovery time for a muscle strain can vary, depending on a person's age and health and the type and severity of the strain. While a minor strain often heals well with home treatment, a severe strain may require medical treatment. If a severe strain is not treated, a person may have long-term pain, limited movement, and deformity.

- Take non-steroidal anti-inflammatory agents such as aspirin and ibuprofen to reduce the pain and to improve your ability to move around.
- Protection, rest, ice, compression, and elevation (known as the PRICE formula) can help the affected muscle. Here's how: First, remove all constrictive clothing, including jewelry, in the area of muscle strain.
- Protect the strained muscle from further injury.

- Rest the strained muscle. Avoid the activities that caused the strain and other activities that are painful.
- Ice the muscle area (20 minutes every hour while awake). Ice is a very effective anti-inflammatory and pain-relieving agent. Small ice packs, such as packages of frozen vegetables or water frozen in foam coffee cups, applied to the area may help decrease inflammation.
- Compression can be gently applied with an Ace or other elastic bandage, which can provide both support and decrease swelling. Do not wrap tightly.
- Elevate the injured area to decrease swelling. For example: prop up a strained leg muscle while sitting.
- Activities that increase muscle pain or work the affected body part are not recommended until the pain has significantly gone away.

Prevention:

- Avoid injury by daily stretching.
- Stretch every time before you exercise.
- Establish a warm-up routine prior to engaging in strenuous exercise.
- Start an exercise program in consultation with your doctor.

## Exercises



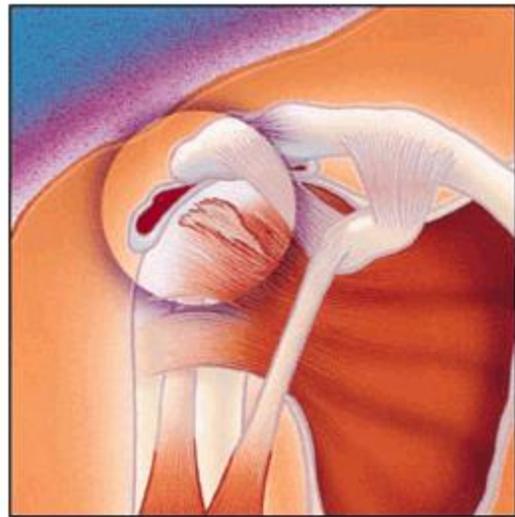
# Shoulder Impingement

## Definition:

Rotator cuff disorders are irritations of or damage to tendons around the shoulder. These disorders include inflammation, calcium buildup (calcific tendinitis), and tears of the tendon. Another rotator cuff disorder is inflammation of the protective sac (bursa) in the shoulder joint. Rotator cuff disorders caused by age-related changes (degeneration) often are associated with rubbing of the tendon on the bone (impingement).

## Cause:

When the subacromial space becomes smaller due to inflammation, bone spurs, or fluid buildup, the rotator cuff tendons may be squeezed and rub against bone (impingement).



Impingement and Partial Rotator Cuff Tears

Figure 2: Impingement lesion.

As a result, the tendons may become damaged and irritated, causing bleeding and inflammation of the bursa or tendons. With continuing damage, the tendons develop scarring and become stringy (fibrous), which makes them weaker and less flexible. Eventually, this may lead to partial or even complete tears.

## Symptoms:

Symptoms of a rotator cuff disorder include pain, stiffness, and general weakness in your shoulder. It may be uncomfortable or impossible to do everyday activities, such as combing your hair, tucking in your shirt, or reaching above your head. Most often, you will feel the pain on the front and side of your shoulder and upper arm. You may have pain during the night and experience trouble sleeping on the affected side. The amount of pain varies, although it often increases when you raise your arm above the shoulder. The pain usually is closely related to the degree of damage.

- **Minor damage:** Pain most often occurs only when you are active, especially while making overhead movements, and is usually relieved with rest.
- **Moderate damage:** You will likely notice pain both during and after activity; it may also occur at night, especially when lying on your shoulder.
- **Severe damage:** You may have continuous pain.

## When to Call the Doctor:

Call your health professional immediately if you have an injury to your shoulder and:

- Your shoulder is very painful.
- Your shoulder appears to be deformed.
- You cannot move your shoulder normally.
- You have signs of damage to the nerves or blood vessels, such as numbness, tingling, a "pins and needles" sensation below the injury, or pale, cold, or bluish skin.

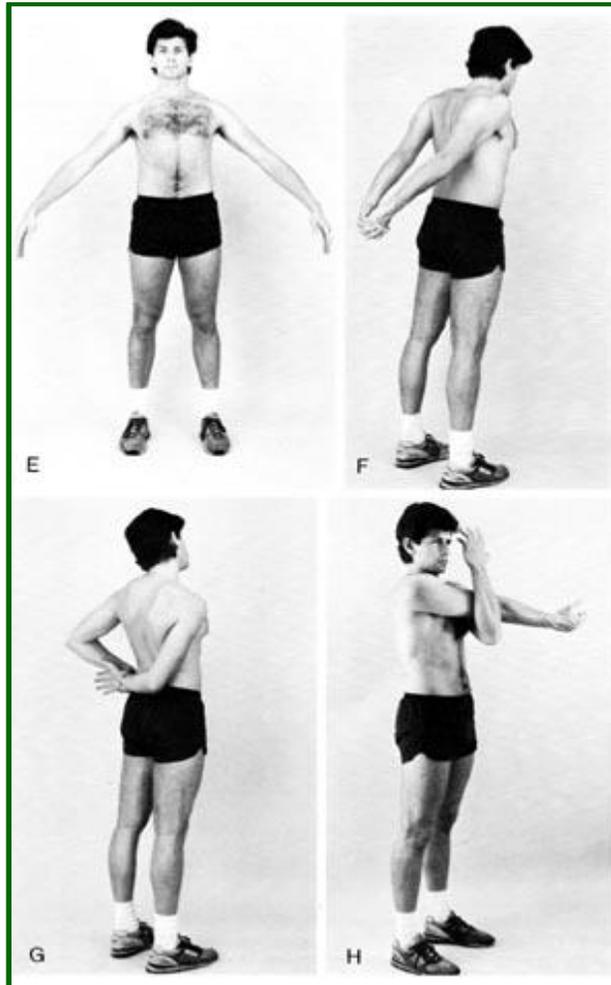
## Home Treatment

- Rest your injured shoulder. Limit repetitive movement, and avoid strenuous activity and activities where your arms move above your head. Be sure to follow your health professional's advice on how long to limit movement; most people do not rest long enough. The rest period for a rotator cuff disorder may be a couple of days to several weeks. During rest:
  - Avoid putting your arm in a sling. It is important that you do not keep your shoulder completely still (immobilized), because it can cause the joint to stiffen permanently.
  - Move your arm carefully through its full range of motion several times a day. Progress slowly to avoid injury.
- Avoid activities or positions that cause discomfort, such as playing golf or tennis or carrying heavy bags of groceries. Stop any activity that hurts your shoulder.
- Take nonsteroidal anti-inflammatory drugs (NSAIDs) such as aspirin, ibuprofen, or naproxen sodium to relieve pain.

## Prevention:

- The long-term changes that occur in and around the shoulder joint as a result of everyday wear and tear cannot be totally prevented. But you may be able to prevent some rotator cuff disorders by:
- Keeping the muscles in your shoulders flexible and strong. Daily exercises to maintain flexibility may be the best defense against rotator cuff disorders.
- Maintaining good posture at all times. Stand straight and relaxed, without slumping.
- Not lifting objects that are too heavy for you.
- Not catching falling objects.
- Avoiding sports or other activities where forceful contact or falls are likely or common.
- Not keeping your arms out to the side or raised over your head for long periods of time, such as when painting a ceiling. If you must do these activities, take frequent breaks, ice your shoulder several times a day and at night, and take a non-steroidal anti-inflammatory drug to relieve any swelling and pain in the tissues that are being pinched. Ask your health professional if it would be helpful to take an anti-inflammatory medication before activities that may stress your shoulder.

# Exercises



# Thoracic Outlet Syndrome

## **Definition:**

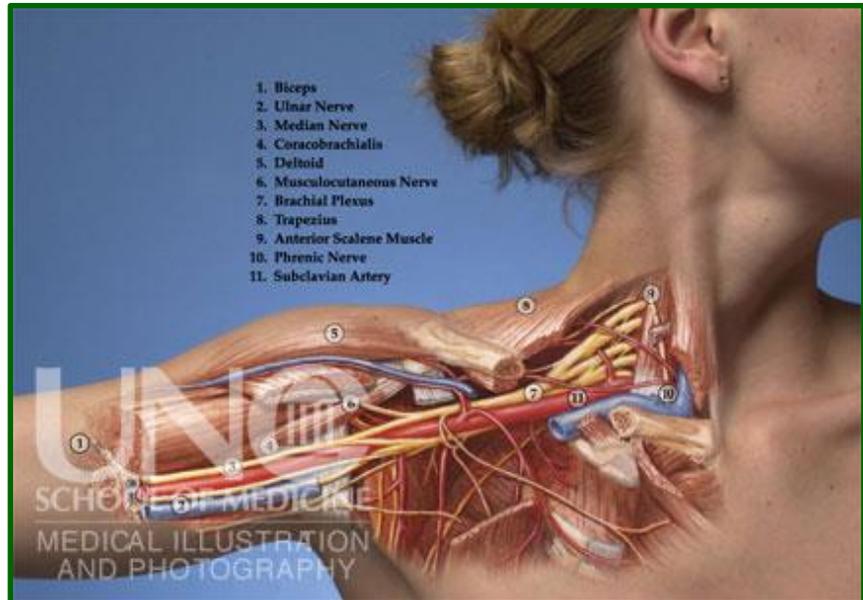
Thoracic Outlet Syndrome (TOS) is a group of distinct disorders producing signs and symptoms attributed to compression of nerves and blood vessels in the thoracic outlet region.

## **Cause:**

Epidemiologic studies have shown that TOS may be associated with certain occupations that involve working in a static position for prolonged periods of time as well as jobs involving heavy lifting.

## **Symptoms:**

Clinical signs and symptoms of TOS usually include pain in the neck and shoulder area and numbness and weakness in the arm/hand.



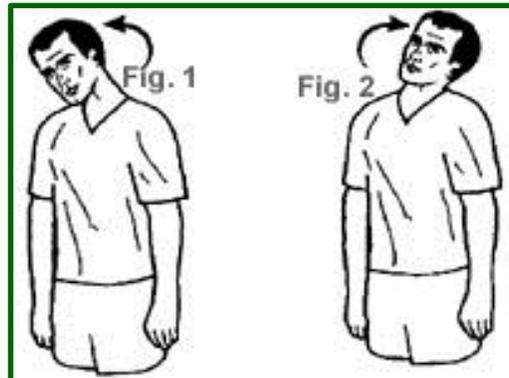
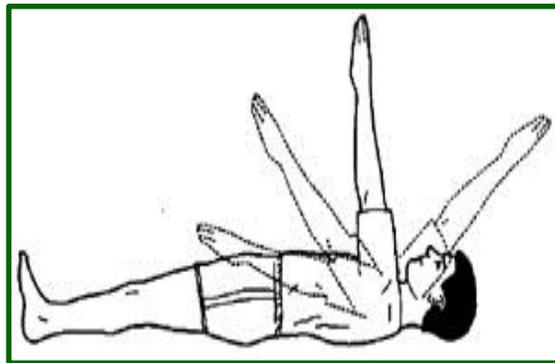
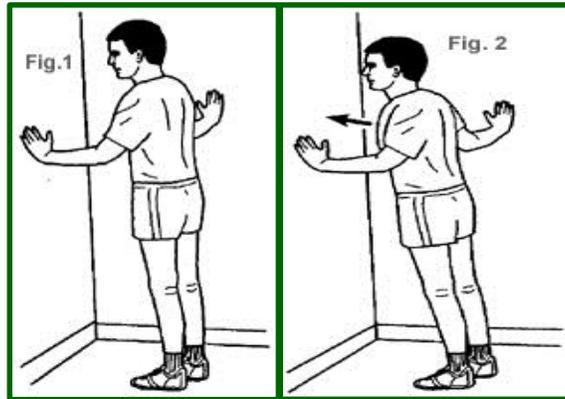
## **Treatment:**

Conservative treatment is usually the first-line approach for the management of patients with TOS. This usually includes physical therapy, postural training, muscle strengthening exercises, and heat treatments with ultrasound. Drugs may be used to control pain and muscle spasms. Most patients with TOS will improve with conservative treatment and only a small number of patients require surgery.

## **Prevention:**

The prevention of thoracic outlet syndrome should focus on the design or redesign of the workplace so that workers will avoid carrying heavy weights, reaching overhead, and lifting with the arms above shoulder level.

# Exercises



## Ergonomics Program Resources

- [CSU Ergonomics Program Home Webpage](#)
- [Ergonomic Evaluation Request](#)
- [Ergo Lab & Equipment Trials](#)
- [Ergonomics Matching Funds Program](#)

## Contact Information

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## Sources

- <http://health.yahoo.com/ency/healthwise/hw213308>
- <http://physicaltherapy.about.com/od/orthopedicsandpt/ss/Tendonitis.htm>
- <http://www.webmd.com/content/article/78/95632.htm>
- <http://www.healthscout.com/ency/68/565/main.html>
- <http://www.wrongdiagnosis.com/e/epicondylitis/intro.htm>
- [http://www.nicros.com/New%20Training%20Center/medial\\_epicondylitis.shtml](http://www.nicros.com/New%20Training%20Center/medial_epicondylitis.shtml)
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