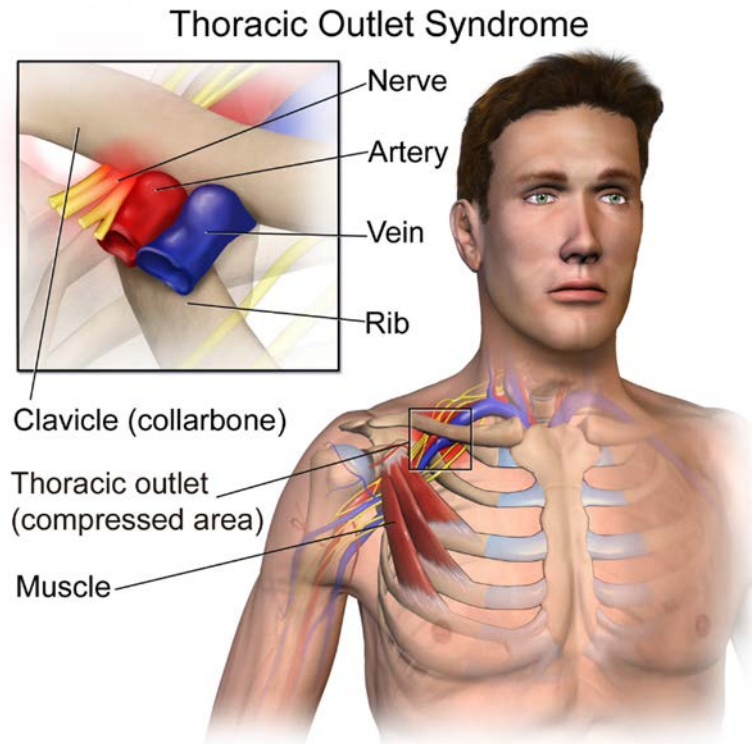




# Thoracic Outlet Syndrome

## What is Thoracic Outlet Syndrome?

Thoracic Outlet Syndrome (TOS) is a group of symptoms that occur when blood vessels or nerves in the space between your collarbone and your first rib (thoracic outlet) are squeezed. (compressed). This weakens the blood circulation in the neck, shoulder and arm. TOS is named for the space between your lower neck and upper chest where this grouping of nerves and blood vessels is found - the thoracic outlet.



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## What are the signs and symptoms of Thoracic Outlet Syndrome?

The signs and symptoms of TOS are pain and numbness in the neck, shoulder, and arm.

## What causes Thoracic Outlet Syndrome?

The exact cause of TOS is unknown, but there are situations that are more likely to squeeze the nerves, veins, or arteries in the thoracic outlet and cause TOS. Common causes and scenarios leading to thoracic outlet syndrome include:

- Physical trauma from a car accident
- Repetitive injuries from job or sports-related activities
- Certain anatomical defects (such as having an extra rib)

- Pregnancy
- Participation in sports involving repetitive and strenuous upper arm activities such as:
  - swimming
  - wrestling
  - pitching
  - gymnastics
  - weightlifting
  - bodybuilding
- Suddenly increasing the intensity of workouts
- Injury to the rib, collar bone, neck, or shoulder

Other factors that may increase the risk of developing TOS include:

- Genetics
- Sleep disorders
- Tumors or large lymph nodes in the upper chest or underarm area
- Stress or depression
- Injury to the neck or back (whiplash injury)
- Poor posture
- Weightlifting
- Repetitive injuries from carrying heavy shoulder loads

### **What are the types of Thoracic Outlet Syndrome?**

#### **Neurogenic Thoracic Outlet Syndrome:**

Neurogenic is the most common type of TOS. It occurs when abnormal portions of bony or soft tissue in the lower neck region compress or irritate the nerves of the brachial plexus. These nerves supply motor (movement) and sensory (feeling) function to the arms and hand.

#### **Signs and symptoms include:**

- pain in the chest, shoulder, or neck region along with numbness and tingling of the arm or hand.
- fatigue
- loss of strength and dexterity (dexterity is the ability to use hands)

Neurogenic Thoracic Outlet Syndrome is the most difficult to diagnose because the signs and symptoms can mimic other conditions.

### **Venous Thoracic Outlet Syndrome:**

This condition occurs when major veins in the lower neck and upper chest are damaged. The vein becomes scarred or narrowed because of the compression and blood clots may develop. The blood clot can cause long term complications so it is extremely important to diagnose and treat this condition promptly and prevent these complications.

#### **Signs and symptoms include:**

- swelling of the arm or hand
- fatigue
- pain or aching
- enlarged or visible veins on the arms, armpit, back or chest

### **Arterial Thoracic Outlet Syndrome:**

The least common but most serious type of TOS is Arterial Thoracic Outlet. This is when bony abnormalities in the lower neck and upper chest that were present at birth compress the artery of the thoracic outlet. This blood vessel delivers blood from the heart to the rest of the body. Over time, compression can damage the artery, creating blood clots that can travel to the fingers. Blood clots can cause painful discoloration or sores on the fingertip and can be life threatening.

#### **Signs and symptoms include:**

- coolness, or paleness of the hand or arm
- pain that increases with use of the hand or arm
- Weakness, numbness and tingling

It is also possible to have a combination of the three types of TOS.

## **How is Thoracic Outlet Syndrome diagnosed?**

To diagnose Thoracic Outlet Syndrome your doctor will do a complete physical exam and review the results of your previous diagnostic tests. Your doctor will order tests and studies to rule out other conditions that may mimic Thoracic Outlet Syndrome but the diagnosis is not based on any single test. Medical tests used to diagnose Thoracic Outlet Syndrome include:

- Nerve conduction study (EMG): evaluates the function of sensory (feeling) and motor (movement) nerves
- Cervical spine X-ray: determines the presence of any bony abnormalities (such as cervical rib)
- Chest X-ray: to rule out cervical rib abnormalities
- CT angiogram: illustrates the relationship of bones and arteries
- Vascular study: assesses the blood flow in arteries and veins
- MRI of the neck: rules out pressure on the cervical spine that may mimic symptoms of TOS
- Computed tomography (CT) scan and magnetic resonance imaging (MRI) of the chest
- Magnetic resonance imaging with angiography (MRA): to view blood vessels
- Arteriogram/venogram: (X-ray that uses dye to look at blood flow)
- Blood tests

Your doctor may order other studies depending on your specific situation. Many of these studies require special procedures developed especially by our doctors to help diagnose TOS.

## **What is the treatment for Thoracic Outlet Syndrome?**

Treatment varies depending on the type of TOS that you have. The goal of treatment is to relieve the pressure (compression) on the vein, artery or nerve.

## What is the treatment for Neurogenic TOS?

### Physical therapy:

The most common early treatment for Neurogenic Thoracic Outlet syndrome is physical therapy. Physical therapy increases the range of motion of the neck and shoulders, strengthens muscles and promotes better posture. Most patients will have an improvement in symptoms after undergoing physical therapy.

### Anti-inflammatory medications:

For pain relief, your doctor may recommend over-the-counter pain medications, such as aspirin, acetaminophen (Tylenol®), or ibuprofen (Motrin®). Your doctor may prescribe a muscle relaxant for additional pain relief. These may be used to **temporarily** relieve pain. They should not be used regularly.

### Decompression Surgery:

Your doctor may recommend surgery if other treatment hasn't been effective or if you have ongoing symptoms. Your doctor may also recommend surgery if you have worsening neurological (brain and nervous system) problems. A surgeon trained in chest (thoracic) surgery or blood vessel (vascular) surgery will perform the procedure.

This surgery has a high risk of failure to improve symptoms. In experienced treatment centers, approximately 50-70 patients out of 100 will have improvement in their symptoms after decompression surgery, but 30-50 patients out of 100 will not. This is why decompression surgery is considered only as a last resort, in cases where the symptoms are seriously affecting your ability to function either in daily life, job, or competitive sports.

### Risks of decompression surgery:

Complications are very rare but include:

- Injury to the Phrenic nerve (nerve in the neck that passes down between the lung and heart) - This can cause shortness of breath.

- Injury to the brachial plexus (nerves near the neck and shoulder) - This can lead to diminished use and feeling in the arm or hand with the risk of paralysis or permanent numbness.
- Pneumothorax (collapsed lung).
- Infection.
- Bleeding.
- Lymphatic fluid leakage.
- Other nerve damage.

### **What is the treatment for Venous TOS?**

There are two main forms of treatment to treat Venous TOS: medications and/or thrombolysis to treat and prevent blood clots and surgery to release pressure (decompress) from the thoracic outlet. In general, early treatment leads to better outcomes.

A. Therapies and procedures to treat and prevent blood clots:

- **Medications:** 2 types of medications are used:
  - a. Clot-busting (thrombolytic) medications - help restore blood flow through the veins by removing existing blood clots as soon as possible.
  - b. Blood thinning (anticoagulant) medications - decrease the blood's ability to clot, and prevent clots from developing. Anticoagulant medications include warfarin (Coumadin®), heparin, low-molecular weight heparin and fondaparinux (Arixtra®). You will receive information about how to take the anticoagulant medication that is prescribed for you

In many cases, the patient will be treated with clot-busting medications and start bleeding thinning medications before surgery.

- **Thrombolysis** (dissolving blood clots):

Thrombolysis or Thrombolytic therapy is the administration of medications that dissolve blood clots - also called "clot busters". The doctor injects the medication directly into the vein or uses a long thin tube (catheter) to deliver

it to the area where the blood clot is located. To be effective, the therapy needs to start within a few days of the first clot formation. It takes place in a hospital setting under close observation.

The clot usually dissolves in a matter of hours to a few days. In some cases, the narrowed area of the vein will need to be treated with angioplasty (opening the vein using a balloon) to keep more clots from forming.

- **Surgery** corrects the narrowing that is causing problems with the vein and may be recommended after the clot in the vein has been effectively treated or dissolved with medications. Surgery for venous TOS is very effective, and improves symptoms in 90 – 95 out of 100 patients.

#### **What is the treatment for Arterial TOS?**

Patients with Arterial TOS often need surgery to remove the first rib and make more room for the vessels and nerves. Surgery may also be performed to repair any structural problems of the artery. Surgery for arterial TOS is very effective and improves symptoms in 90 – 95 out of 100 patients. Some patients receive “clot buster” medications before the surgery.

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