CONDITION

Thoracic outlet syndrome

Thoracic outlet syndrome is compression of nerves or blood vessels between the lower neck and upper chest.

WHAT IT IS
Compression of nerves or blood vessels near the shoulder

BODY SYSTEM
Nervous system, muscles and bones, heart and circulation

MAIN SYMPTOMS
Arm pain, tingling, weakness, swelling or colour change

WHAT CAUSES IT
Narrow anatomy, injury, posture, or repetitive arm movement

HOW IT IS DIAGNOSED
Examination plus nerve tests or vascular imaging

MAIN TREATMENT
Physical therapy, symptom control, or decompression surgery

CAN IT BE CURED?
Sometimes - decompression can provide lasting relief

IS IT AN EMERGENCY?
Sometimes - sudden swelling or a cold, pale hand

LONG-TERM OUTLOOK
Often manageable, but recovery may take months

Overview

Thoracic outlet syndrome, or TOS, is a group of conditions caused by pressure on nerves or blood vessels near the base of the neck. These structures pass through a small space called the thoracic outlet, between the collarbone and first rib, on their way into the arm.

There are three main types:

Symptoms can overlap with neck, shoulder, nerve, and circulation conditions. There is no single test that confirms every form of TOS, especially neurogenic TOS. A careful assessment is important before treatment begins.

Most nerve-related cases are not emergencies. Sudden arm swelling or signs of reduced blood flow require urgent assessment because they can indicate a blocked blood vessel.

- Neurogenic TOS affects the bundle of nerves that controls movement and feeling in the shoulder, arm, and hand. It is the most commonly diagnosed type.
- Venous TOS affects a vein carrying blood back from the arm to the heart. It can cause swelling and a blood clot.
- Arterial TOS affects an artery carrying blood into the arm. It may reduce blood flow to the hand.

Symptoms

Symptoms usually affect one arm, although both sides can be involved. They may become worse when you lift your arm, carry something, or keep your shoulder in one position for a long time.

Neurogenic TOS may cause:

The exact pattern is not always consistent. Symptoms may come and go, and they can resemble a pinched nerve in the neck, carpal tunnel syndrome, or another shoulder or arm problem.

Venous TOS may cause swelling of the whole arm or hand. The arm may feel heavy, tight, or painful and may look blue or purple. Surface veins around the shoulder or chest can become more noticeable. These symptoms may appear suddenly if a clot forms in the deep vein beneath the collarbone.

Arterial TOS can make the hand cold, pale, or bluish. You may have hand pain, numbness, weak or absent wrist pulses, or sores on the fingers that are slow to heal. Symptoms may occur when small clots or narrowing reduce blood flow.

- Pain in the neck, shoulder, arm, or hand
- Tingling or numbness, often in the forearm and fingers
- Arm fatigue or a feeling of heaviness
- Reduced grip strength or difficulty with fine hand movements
- Symptoms during overhead activity, driving, or carrying a bag

Causes and risk factors

The thoracic outlet is naturally narrow. Symptoms develop when its nerves, vein, or artery are compressed or repeatedly irritated.

Some people are born with anatomy that reduces the available space. One example is a cervical rib , an extra rib arising from the lowest part of the neck. An unusually shaped first rib, tight fibrous tissue, or differences in the neck and shoulder muscles can also contribute. Having one of these features does not mean you will develop TOS.

An injury may start symptoms. This includes a collarbone fracture, a strong pull on the arm, or whiplash affecting the neck and shoulder. Scar tissue and changes in muscle movement after an injury can narrow the space.

Repeated overhead movement may place stress on the area. TOS can occur in people whose work or sport involves frequent lifting, throwing, swimming, or holding the arms above shoulder level. Heavy muscle development around the shoulder can sometimes contribute.

A drooping shoulder position, poor shoulder control, or tight chest and neck muscles may increase pressure in some people. However, posture alone does not explain every case, and symptoms are not a personal failure.

Rarely, a growth or another structural problem near the upper chest can cause compression. Your assessment may look for these less common causes when the symptoms or examination suggest them.

Diagnosis

Diagnosis begins with the history of your symptoms. You may be asked where the discomfort occurs, what triggers it, whether your arm swells, and whether your hand changes colour or temperature.

During an examination, a clinician may check strength, sensation, reflexes, pulses, arm size, skin colour, and shoulder movement. You may be asked to move or hold your arm in positions that bring on symptoms. These position-based tests cannot confirm TOS by themselves because they can also be positive in people without the condition.

Tests are chosen according to the suspected type and other possible explanations.

An ultrasound can assess blood flow and look for a clot in a vein or artery. CT angiography or MR angiography can show blood vessels and nearby structures, sometimes with the arm in different positions. A venogram or arteriogram uses contrast dye to produce detailed blood vessel images and may be used when planning a procedure.

X-rays can show a cervical rib, previous fracture, or another bone difference. MRI may help examine soft tissues or look for a neck or shoulder condition.

Nerve conduction studies and electromyography measure nerve and muscle function. They

can identify nerve damage or a different problem, although results may be normal in some people with suspected neurogenic TOS.

Because symptoms can have several causes, diagnosis may involve ruling out conditions such as a neck disc problem, peripheral nerve compression, shoulder disease, or blood vessel disease.

Treatment and management

Treatment is based on whether nerves, a vein, or an artery are being compressed.

For neurogenic TOS, treatment often begins with physical therapy. Therapy focuses on shoulder movement and control, chest and neck flexibility, breathing mechanics, and reducing pressure on the nerve bundle. Changes to lifting technique, workstation setup, and repetitive activity may also help.

Symptoms can initially fluctuate as activity changes. A planned rehabilitation program often takes weeks or months rather than days. Pain medicines may be used when appropriate, but they do not correct the compression itself. In selected cases, an injection may help assess the source of symptoms or provide temporary relief.

Surgery may be considered when well-directed non-surgical treatment has not controlled significant neurogenic symptoms, or when there is clear progressive nerve damage. Thoracic outlet decompression usually involves removing part of the first rib, releasing tight muscles or bands, or both. Recovery includes rehabilitation and can take several months.

Venous TOS with a blood clot needs prompt treatment. Treatment may include anticoagulation, commonly called blood-thinning medicine. Some recent or severe clots are treated with a catheter procedure that removes or dissolves the clot. Decompression surgery may then be recommended to reduce the chance of renewed blockage. The timing and combination of treatments are decided by a specialist team.

Arterial TOS is commonly treated with surgery because ongoing compression can damage the artery or send small clots into the hand. Treatment may include decompression and repair of the affected artery.

Every procedure has risks. For TOS surgery, these include bleeding, infection, injury to nearby nerves or blood vessels, a collapsed lung, continuing symptoms, or symptoms returning. The expected benefits and risks differ by TOS type and by the structures involved.

Complications

Ongoing nerve compression can lead to persistent pain, numbness, reduced grip, or muscle wasting in the hand. Severe permanent nerve damage is uncommon but is less likely to recover fully, which is why progressive weakness needs timely assessment.

Venous compression can cause a deep vein thrombosis, meaning a clot in a deep arm vein. The vein may remain narrowed or damaged after the clot, leading to lasting swelling, heaviness, or discomfort. Part of a clot can occasionally travel to the lungs and cause a pulmonary embolism.

Arterial compression can damage the artery wall, sometimes producing a widened area called an aneurysm. Clots may form and travel into smaller hand arteries. Without prompt treatment, severely reduced blood flow can injure fingers or other tissues.

Prevention

TOS caused by an extra rib or another inherited body structure cannot be reliably prevented. Not everyone with these features develops symptoms.

If repeated movement contributes to symptoms, adjusting technique, workload, equipment, or rest periods may reduce strain. Building shoulder strength and mobility gradually may also help. These measures cannot guarantee prevention, especially after an injury or when a blood vessel is being compressed.

If you have previously had venous or arterial TOS, follow-up matters. Monitoring and any advised treatment are intended to reduce the risk of another clot or further blood vessel damage.

Living with it and what to expect

The course depends strongly on the type of TOS and whether nerve or blood vessel damage has occurred.

With neurogenic TOS, symptoms often change with activity and shoulder position. Many people can continue work, exercise, and everyday tasks with rehabilitation and practical changes. Progress may be uneven, and some activities may need temporary limits. Improvement commonly takes months, while some people continue to have intermittent or persistent symptoms.

After decompression surgery, pain from the operation gradually settles, but strength, movement, and nerve symptoms may recover at different rates. Nerves recover slowly, and longstanding weakness or numbness may not disappear completely. Some people need ongoing rehabilitation or further assessment for continuing symptoms.

After venous TOS, swelling may improve once the clot and compression are treated. Some people are left with arm heaviness or swelling because the vein has been damaged. Follow-up may include checking circulation and reviewing blood-thinning treatment.

People treated for arterial TOS generally need ongoing monitoring of the repaired artery and blood flow into the hand. New colour changes, coldness, or pain should not wait for a routine appointment.

Routine follow-up is also appropriate if rehabilitation is not helping, symptoms are limiting sleep or work, or weakness is gradually increasing.

When to get medical help

Arrange a non-urgent medical assessment if you have recurring arm pain, tingling, numbness, heaviness, or weakness, especially when symptoms are linked to arm position or overhead movement. These symptoms have several possible causes, so an assessment can help identify the source.

Seek urgent same-day medical care for:

Call emergency services for sudden shortness of breath, chest pain, coughing up blood, fainting, or severe breathing difficulty. These symptoms can occur if a blood clot reaches the lungs.

A cold, very painful, pale hand with sudden weakness or loss of movement is also an emergency because blood flow may be severely reduced.

- Sudden swelling, pain, tightness, or blue-purple colour in one arm
- New prominent veins around the shoulder or chest
- A hand that becomes unusually cold, pale, or blue
- Rapidly worsening hand weakness or loss of feeling

Common questions

Is thoracic outlet syndrome serious?

Nerve-related TOS is often manageable and is not usually an emergency. Venous or arterial TOS can be serious because it may involve a blood clot or reduced blood flow. Sudden swelling, colour change, or a cold hand needs urgent assessment.

Can thoracic outlet syndrome go away on its own?

Mild symptoms may settle after an irritating activity stops, but recurring symptoms can continue without targeted changes or rehabilitation. Blood vessel TOS should not be left to settle on its own because a clot or artery injury may need prompt treatment.

Can I exercise with thoracic outlet syndrome?

Many people can remain active, but movements that repeatedly trigger numbness, marked pain, swelling, or colour change may need to be modified. A physical therapist can help plan gradual activity that supports shoulder function without repeatedly irritating the affected area.

Does massage fix thoracic outlet syndrome?

Massage may temporarily ease tight or painful muscles, but it does not remove an extra rib, treat a clot, or repair an injured artery. Forceful pressure is not appropriate when a blood vessel problem is suspected.

Will I need surgery?

Not everyone does. Neurogenic TOS is often treated first with rehabilitation. Surgery is more likely when symptoms remain disabling despite appropriate treatment, nerve damage is progressing, or a vein or artery is significantly affected.

What kind of specialist treats thoracic outlet syndrome?

Care may involve a vascular surgeon, neurologist, rehabilitation specialist, orthopaedic or upper-limb specialist, and physical therapist. The most relevant specialty depends on whether symptoms appear to come from nerves, veins, or arteries.

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