

# Thoracic outlet syndrome

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## General information

The [thoracic outlet](#) is a confined area at the [apex](#) of the [lung](#) bordered by the 1st [rib](#) below and the [clavicle](#) above through which passes the [subclavian artery](#), vein, and [brachial plexus](#).

Thoracic outlet syndrome (TOS) is a term implying compression of one or more of the enclosed structures producing a heterogeneous group of [disorders](#). TOS tends to be diagnosed more often by general and vascular surgeons than by neurologists and neurosurgeons. Four unrelated conditions with different structures involved:

1. "noncontroversial," with characteristic symptom complex, reproducible clinical findings, and confirmatory laboratory tests. Low incidence <sup>1)</sup>.

- Arterial vascular: producing arm, hand, and finger pallor and ischemia
- Venous vascular: producing arm swelling and [edema](#) see [Venous thoracic outlet syndrome](#).
- True neurologic: compressing the lower trunk or median cord of the brachial plexus

2. disputed neurologic: includes [scalenus anticus syndrome](#)

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Thoracic outlet syndrome (TOS) is a syndrome involving compression at the thoracic inlet which is known clinically as the superior thoracic outlet resulting from excess pressure placed on a neurovascular bundle passing between the anterior scalene and middle scalene muscles.

It can affect one or more of the nerves that innervate the upper limb and/or blood vessels as they pass between the chest and upper extremity, specifically in the brachial plexus, the subclavian artery, and, rarely, the subclavian vein.

TOS may result from a positional cause, for example, by abnormal compression from the clavicle

(collarbone) and shoulder girdle on arm movement. There are also several static forms, caused by abnormalities, enlargement, or spasm of the various muscles surrounding the arteries, veins, and/or brachial plexus, a fixation of a first rib, or a cervical rib. A Pancoast tumor (a rare form of lung cancer in the apex of the lung) can lead to thoracic outlet syndrome in the progressive stages of the disease. The most common causes of thoracic outlet syndrome include physical trauma from a car accident, repetitive strain injury from a job such as frequent nonergonomic use of a keyboard, sports-related activities, and anatomical defects such as having an extra rib. In pregnancy, if a narrow superior thoracic outlet exists previously, the patient can have symptoms for the first time. Joints loosen during pregnancy, making it easier to develop bad posture.

Common orthopaedic tests used are the Adson's test, the Costoclavicular Manoeuvre, and the "Hands-Up" test or "EAST" test. Careful examination and X-ray are required to differentially diagnose between the positional and static etiologies, first rib fixations, scalene muscle spasm, and a cervical rib or fibrous band.

## Differential diagnosis

1. [herniated cervical disc](#)
2. [cervical arthrosis](#)
3. [lung cancer](#) ([pancoast tumor](#))
4. tardy [ulnar nerve palsy](#)
5. [carpal tunnel syndrome](#)
6. orthopedic shoulder problems
7. [complex regional pain syndrome](#) ([reflex sympathetic dystrophy](#)).

# True neurologic Thoracic outlet syndrome

## General information

A rare condition primarily affecting adult women, usually unilateral. Neurologic structures involved

Most common: compression of the [Cervical spinal nerve 8/T1](#) roots

or proximal lower trunk of the [brachial plexus](#) (BP)

less common: compression of the median cord of the BP

## Diagnosis

Confirmatory tests 1. EMG: unreliable (may be negative). Most common abnormality in neurogenic TOS is loss of medial antebrachial cutaneous SNAP

2. MRI does not show bony abnormalities well, but may occasionally demonstrate a kink in the lower BP. Can also rule out conditions that may mimic TOS, such as [herniated cervical disc](#)

3. cervical spine X-rays with obliques and apical lordotic CXR may demonstrate bony abnormalities. However, not every cervical rib produces symptoms (some patients with bilateral cervical ribs may have unilateral TOS).

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<sup>1)</sup>

Wilbourn AJ. The Thoracic Outlet Syndrome is Overdiagnosed. Arch Neurol. 1990; 47:328-330

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