Nerve Palsies - Thoracic Outlet Syndrome

The thoracic outlet is the region between the anterior and middle scalene muscles, which is bounded by the manubrium anteriorly, the first rib laterally and T1 vertebra posteriorly. Thoracic outlet syndrome (TOS) occurs when the brachial plexus and subclavian arteries which run through this outlet, are compressed. Symptoms include upper limb and hand pain, swelling, tingling, numbness, pallor, atrophy of the intrinsic muscles of the hand, and muscle weakness. Patients can also present with ulnar claw. TOS can be caused by cervical rib anomalies, Pancoast tumors, trauma, and hypertrophy of the surrounding muscles commonly seen in weightlifters.



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Nerve

Compression of Brachial Plexus
Compressing Brachial Plexus
The brachial plexus runs through the thoracic outlet. The lower trunk nerve roots from C8 and T1 are most commonly involved in this syndrome. These nerve roots supply the ulnar nerve, and partly contribute to the radial and axillary nerves.

Compression of Subclavian Vessels
Compressing Sub-clavicle Vessels
The subclavian artery and subclavian vein course through the thoracic outlet between the anterior and middle scalene muscles. Compression of these vessels can cause downstream ischemia of the hand and arm, resulting in symptoms.

Causes

Cervical Rib Abnormality
Cervical Ribs
A cervical rib is an extra rib which arises from the seventh cervical vertebra, above the first rib. A supernumerary rib like this, or an abnormally elongated vertebral transverse process may compress the thoracic outlet.

Trauma
Trauma-spike
Injuries to the the neck, such as whiplash from a car crash, sports related accidents may damage or compress the contents of the thoracic outlet.

Weight Lifters
Weight Lifting
Athletes such as weight lifters, swimmers, volleyball, tennis or baseball players, who perform motions involving repetitive upper limb abduction and external rotation are at increased risk for developing TOS. These motions may cause hypertrophy of the muscles surrounding the thoracic outlet, such as the anterior and middle scalene, subclavius, and pectoralis minor muscles.

Pancoast Tumor
Pan-coaster Tumor
These are carcinomas that form at the apex of the lung, (which is also known as the superior sulcus) that can invade the thoracic outlet due to the proximity of the lung apices.

Presentation

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Edema

Edamame

Compression of the subclavian vessels can cause increased hydrostatic pressure, resulting in edematous swelling in the upper limb and hand. The upper limb may also become pale due to decreased blood flow and oxygen delivery.

Claw Hand

Claws Hand

Compression of the lower trunk of the brachial plexus affects the proximal ulnar nerve. The ulnar nerve innervates the muscles that flex the forearm and the fourth and fifth digits. If the nerve roots supplying the ulnar nerve are compressed, the lumbricals cannot flex the fourth and fifth digits, so the hand appears as a claw.

Pain

Pain-bolt

Compression of the thoracic outlet can cause neuropathic pain which may be described as a burning or sharp sensation.

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