

THORACIC OUTLET SYNDROME

I. BACKGROUND

The thoracic outlet syndrome (TOS) is a potential cause of neck, arm, and/or hand pain. TOS is more common among women than men, and occurs most frequently in the 2nd through 4th decades. The thoracic outlet is located at the superior aspect of the thorax; neural and/or vascular compression attributed to the thoracic outlet syndrome has been described as occurring at up to 9 anatomic locations, with the three most common being (a) the interscalene triangle, (b) between the first rib and the clavicle, and (c) between the pectoralis minor and thoracic cage. Risk factors include anatomic anomalies (cervical rib, long transverse process at the cervical spine, clavicle fracture or anomaly, bifid first rib or fusion of the 1st and 2nd ribs, tumor, subclavian artery aneurysm, etc.), trauma, or occupations requiring prolonged, static shoulder protraction postures and/or frequent shoulder abduction activity such as reaching or lifting over shoulder height.

This diagnosis often requires consultation by a specialist (neurologist, neurosurgeon, orthopedist, physiatrist, or vascular surgeon). Treatment is non-surgical in the majority of cases, but surgical decompression of the brachial plexus and/or vascular structures may be required in some instances.

II. DIAGNOSTIC CRITERIA

A. History and Physical Examination

Patients most commonly complain of supraclavicular shoulder pain with radiation to the medial arm and forearm, often with numbness and/or coolness in the 4th and 5th digits of the hand. Hand weakness, difficulty with fine motor skills and/or cold intolerance may be reported. Cervical motion may increase symptoms, and headaches may develop. A cool, pale hand or a swollen upper extremity may be reported. Symptom duration ranges from weeks to years, with an average of 18 months. Ten percent of patients have bilateral hand symptoms. Differential diagnosis includes carpal tunnel syndrome, ulnar neuropathy, cervical radiculopathy, medial epicondylitis, fibromyalgia, CRPS-1, axillary vein thrombosis, subclavian steal syndrome and/or apical lung tumor.

Physical examination should include a complete orthopedic and neurovascular examination, with attention to: sensation, reflexes, strength, range of motion, muscle atrophy and pulses. Specific diagnostic tests include:

1. Adson's maneuver, in which the shoulder is abducted and externally rotated with the neck extended, and the radial pulse is palpated. A positive test includes a decrease in the radial pulse pressure.

2. Wright's maneuver, in which the shoulders are abducted and externally rotated as the patient inhales deeply and holds his/her breath. A positive test includes a reproduction of paresthesias in the symptomatic distribution.

3. Roos test, in which the shoulders are fully flexed, and repetitive, rapid finger flexion and extension are performed. A positive test includes a reproduction of paresthesias in the symptomatic distribution.

B. Diagnostic Test Procedures Include:

1. X-rays of the cervical spine to rule out cervical rib and/or apical tumor.
2. Electrodiagnostic studies including nerve conduction testing and electromyography. Findings associated with a diagnosis of Thoracic Outlet Syndrome include EMG changes such as fibrillations and positive waves, prolongation of the ulnar F wave, and a decrease in the ulnar nerve and/or medial antebrachial cutaneous nerve sensory nerve action potential (SNAP). Over 40% of patients with TOS may have a concomitant carpal tunnel syndrome.
3. MRI of the cervical spine may rule out cervical disc herniation or a space-occupying lesion (tumor, cyst, abscess, etc.). Magnetic resonance neurography (MRN) of the brachial plexus may be used to image the brachial plexus.
4. MRA, ultrasound or CT-angiography may demonstrate compression of the supraclavicular vasculature.

III. TREATMENT

A. Non-operative

1. Application of a specific exercise protocol, as may be provided under the direction of a physical therapist or occupational therapist. Scapular retraction (passive and active) and cervical active range of motion exercises are generally included.

2. Avoidance of carrying heavy objects; avoidance of persistent and/or repetitive activities with the shoulders flexed and/or abducted; avoidance of straps placed across the shoulders, such as with carrying a heavy backpack.

3. Medication: Analgesics, NSAIDs, tricyclics, SSRIs, muscle relaxants, and/or anticonvulsants. If a vascular obstruction is identified, thrombolytic medication may be indicated.

4. Injection of the anterior and middle scalene muscles with botulinum toxin may reduce spasm and compression of nerves passing between these muscle structures. Injection with local anesthetic and/or steroid preparations do not provide long-lasting benefit and are not recommended as treatment.

B. Operative

1. Surgical resection of a segment of the first rib.
2. Scalenectomy or removal of cervical rib or rudimentary rib via a supraclavicular approach.
3. An infraclavicular surgical approach may be used for a pectoralis minor compression of nerve or vascular structures.

IV. ESTIMATED DURATION OF CARE

Non-operative care options are indicated prior to consideration of operative treatment. Non-operative care may be provided for at least 8 weeks prior to considering surgery, and may be continued until the point of maximum medical improvement.

Operative treatment, followed by a post-operative treatment phase of up to 6 months' duration, should lead to a point of maximum medical improvement in most cases.

PROTOCOL HISTORY:

Passed:	9/1/1992
Amended:	9/16/2003
Amended:	5/5/2009
Amended:	1/28/2020