



## WHAT IS THORACIC OUTLET SYNDROME?

Thoracic outlet syndrome (TOS) is a group of rare conditions that involves compression of the nerves or blood vessels that pass through the thoracic outlet. There are 3 types of TOS. Compression of the nerves that pass through the thoracic outlet is known as Neurogenic TOS (NTOS). Compression of the subclavian vein is known as Venous TOS (VTOS) and can lead to blood clots. Compression of the subclavian artery is known as Arterial TOS (ATOS) and can lead to blood clots or an aneurysm. 95% of cases are neurogenic. 3-4% of cases are venous. 1-2% of cases are arterial.

### SYMPTOMS

- Pain in shoulder, arm and/or hand
- Numbness or tingling in shoulder, arm and/or hand. Most commonly in the pinky and ring fingers, but can involve any or all fingers
- Temperature and color changes of the hand (cold & bluish purple) or (hot & red)
- Neck muscle spasm, tightness and pain
- Occipital headaches
- Clavicle pain
- Scapula pain
- Upper back muscle spasm, tightness and pain
- Feeling of fatigue or heaviness in the arm when elevated
- Supraclavicular swelling
- Loss of hand and finger dexterity, dropping things
- Less common symptoms include ear pain, facial pain, shortness of breath, heart palpitations, & dizziness
- Can vary throughout the day or from day-to-day in location, type, and severity

## VENOUS THORACIC OUTLET SYNDROME

### SYMPTOMS

- Swelling of arm from shoulder to hand - often twice the size of the other arm
- Blue, purple or red discoloration of arm and hand
- Arm and hand feel warm or hot to the touch
- Large visible collateral veins across the chest and front of the shoulder
- Can present acutely and constant in the presence of a blood clot
- Can present more chronically with symptoms resolving when arm is at rest (no blood clot yet)

### DIAGNOSIS

- Venous doppler ultrasound to look for blood clot and vein blockage
- CT or MR Angiogram of the chest when suspicion of clot is high but ultrasound was negative and to determine the condition of the vein and locate area of vein compression which should be in the costoclavicular area
- CT or MR Angiogram of the chest when symptoms of venous congestion are more chronic and positional to check for area of compression when arm elevated and verification of symptoms that ensue
- Catheter directed venogram is gold standard diagnostic tool and also has ability to perform immediate thrombolysis
- Ultrasound has false negative rate of approx 30% due to clot location often between first rib and clavicle
- Positional vein compression without symptoms of venous congestion is NOT diagnostic of VTOS

### TREATMENT

- Referral to TOS specialist vascular surgeon for surgical decompression

### DIAGNOSIS

- Clinical diagnosis of exclusion
- No single test can prove or disprove existence of NTOS
- Testing is ordered to rule out more common conditions that mimic NTOS
- Most common tests ordered are Cervical MRI, Shoulder MRI, and EMG to rule out cervical radiculopathy, shoulder pathology, and distal nerve compression syndromes such as carpal and cubital tunnel
- Once other conditions are ruled out, referral should be made to a TOS specialist vascular surgeon
- Roos Test (Elevated Arm Stress Test) can be a helpful diagnostic tool
- Lidocaine muscle block injection to the anterior scalene muscle is a test that is very specific to NTOS which pain management or physiatrist can perform
- Positional loss of pulse is clinically irrelevant to NTOS
- Normal EMG does not rule out NTOS
- In 2016, diagnostic criteria was published in the Journal of the Society for Vascular Surgery

### TREATMENT

- Activity modification - no overhead activity, lifting heavy weights, repetitive arm/hand tasks
- Ergonomic workspace setup
- Leave of absence from work, sport or hobby
- Medications - NSAIDs, muscle relaxers, steroids, antidepressants, anti-seizure meds, opioids
- Topicals such as lidocaine, compounded creams, Voltaren
- Physical Therapy with a TOS knowledgeable therapist
- Botox injections to the scalene muscles
- Trigger point injections/dry needling
- Massage therapy
- Osteopathic therapy
- Surgical decompression involving removal of first rib, anterior/middle scalene muscles, fibrous bands, and scar tissue

## ARTERIAL THORACIC OUTLET SYNDROME

### SYMPTOMS

- Fatigue, cramping, heaviness, or pain/aching in the arm especially with use or exercise
- Coldness, numbness and/or tingling in the arm, hand or fingers
- Pale, bluish or mottled appearance of the arm, hand, or fingers
- Pulse near the elbow and wrist (brachial, radial, or ulnar pulses) may be weak or absent with arm at rest
- A pulsing, non-tender lump or bulge at the base of the neck in the area above and around the collarbone may represent an aneurysm

### DIAGNOSIS

- Extremely rare and is almost always associated with a cervical rib or other bony abnormality
- Doppler ultrasound to check for blood clots and blood flow abnormalities
- CT or MR Angiogram of the chest to determine the condition of the artery including presence of damage, aneurysm or clot and locate area of artery compression
- Provocative maneuver tests such as Adson's and Wright's tests have a high false positive rate as they only assess artery compression and loss of pulse triggered by certain neck and arm movements
- Diagnosis should not be made based only on a positive provocative maneuver test
- Positional artery compression and/or loss of pulse by itself is NOT considered ATOS
- A critical element is the presence of damage to the wall of the artery resulting in dilatation, aneurysm or a clot.

### TREATMENT

- Referral to TOS specialist vascular surgeon for surgical decompression

## RESOURCES



TOS Outreach Surgeon List



TOS Diagnostic Criteria Publication



Thoracic Outlet Syndrome Textbook