

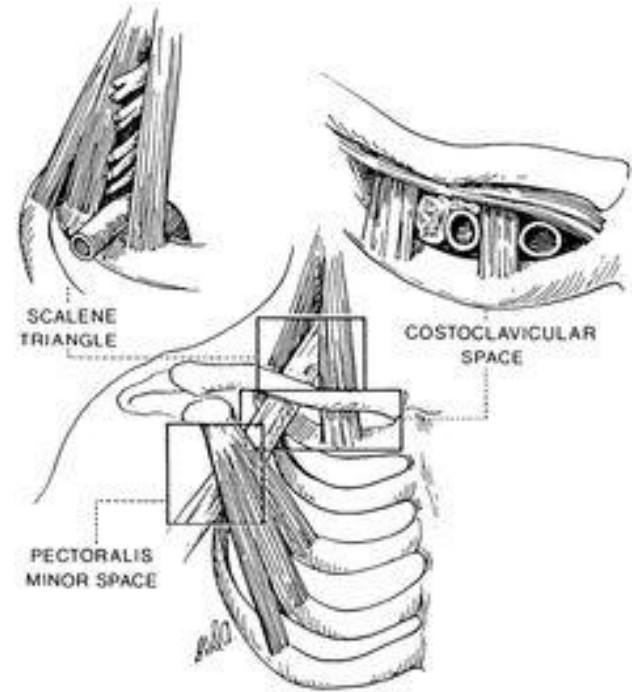
Thoracic Outlet Syndrome

Allie Finch, Tina Stough, Marissa Bunge



Definition

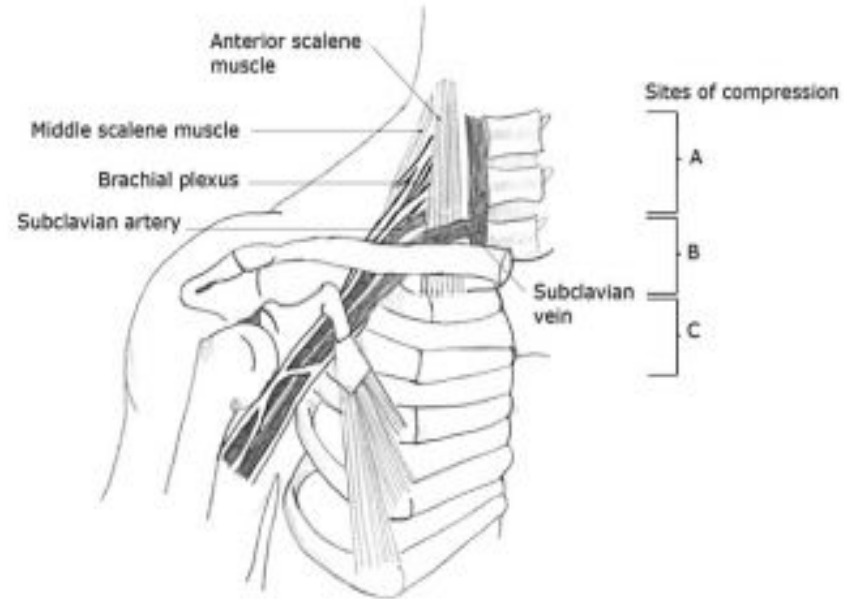
- TOS is a complex syndrome that is characterized by pain, paresthesia, weakness and discomfort due to compression of the subclavian vein, artery and/or the brachial plexus as they pass through the thoracic outlet¹
 - 3 possible sites of compression: scalene muscles, clavicle, sub-coracoid tunnel



→ **Thoracic Outlet: narrow space between clavicle and 1st rib**

Anatomic Review

- Boundaries:
 - **Medially:** scalene
 - **Posteriorly:** upper trap
 - **Anteriorly:** pectoralis minor
- Bone involvement:
 - Transverse process of the cervical vertebrae
 - 1st or 2nd cervical ribs
 - Clavicle
 - Scapula



Definition

➤ Neurological TOS (nTOS):

- Compression of the brachial plexus
- Including:
 - Upper: C5-C7
 - Lower: C8-T1
- Most common

➤ Vascular TOS (vTOS):

- Including:
 - Arterial TOS (aTOS)
 - Compression of the subclavian artery
 - Least common
 - Venous TOS (vTOS)
 - Compression of the subclavian vein

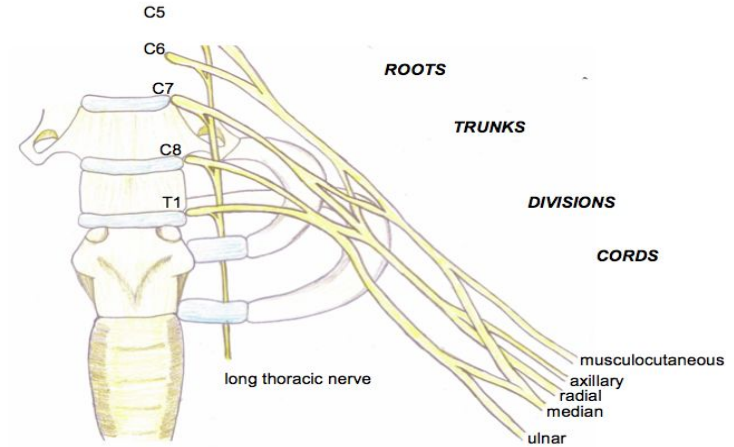


Figure 4. Brachial plexus

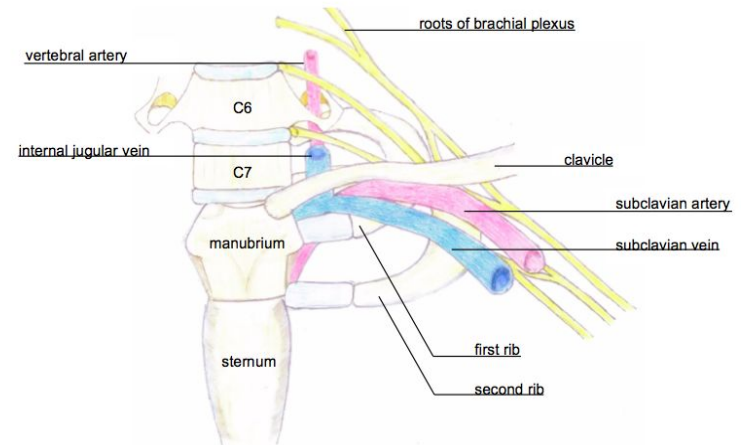


Figure 3. Anatomy of the thoracic outlet, demonstrating subclavian artery, vein and brachial plexus passing between the clavicle and first rib

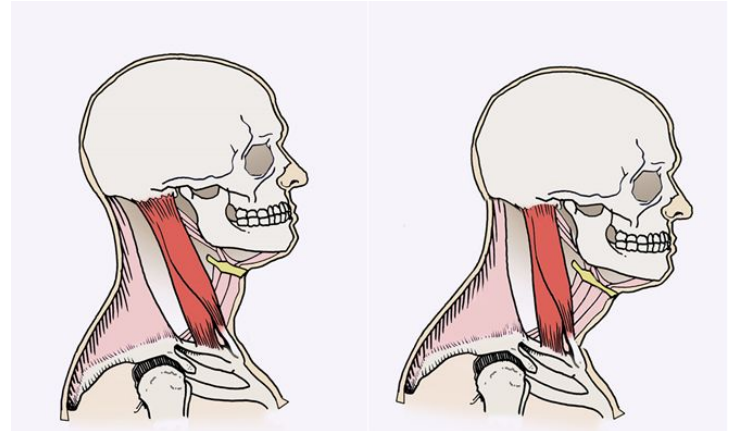
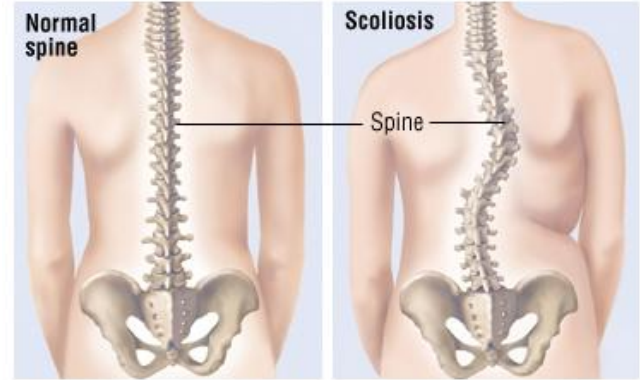
Etiology and Mechanism of Injury

➤ Etiology

- Congenital abnormalities
- Post-traumatic causes
- Functionally acquired cases
- Other acquired cases

➤ MOI: changing the size and/or shape of the thoracic outlet

- MVA, Falls, etc.
- Overuse
- Long-standing forward head posture
- Entrapment
- Compression



Signs/Symptoms

➤ Neurological TOS

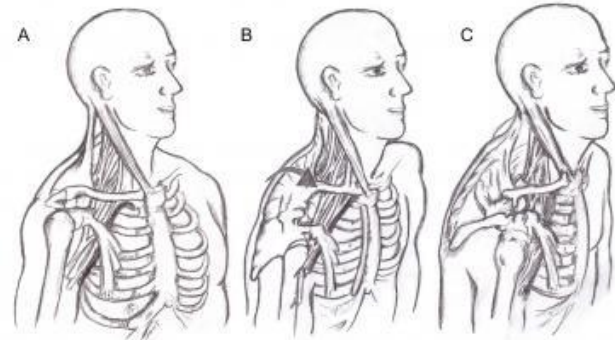
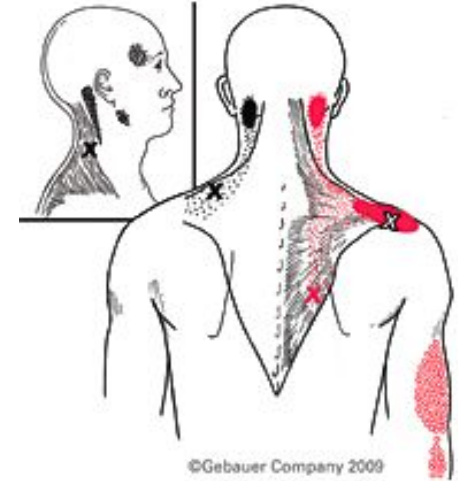
- nTOS
 - Wasting of the thenar eminence
 - Numbness or tingling in the hand and fingers
 - Pain in the neck, shoulder, arm, or hand
 - Weak grip
 - Burning type of discomfort
 - Sensory changes

➤ Vascular TOS

- vTOS
 - Discoloration of the hand
 - Arm pain
 - Cold fingers/hands
 - Weak pulse
 - Throbbing lump near clavicle
 - Distal edema
 - Dull Ache
 - Heavyness

Risk Factors

- Risk Factors
 - Poor posture
 - Rounded shoulders and forward head
 - Repetitive activities
 - Overhead activities
 - Constant muscle tension in shoulder girdle
 - Women > Men
 - Age for diagnosis: 20-50 y/o



Complications

- Blood clots
 - Can lead to brain aneurysm and possible stroke
- Ischemia that threatens the integrity of the limb
 - Spontaneous swelling of the arm, cyanosis, heaviness of the affected limb
 - Surgery - Transaxillary or paraclavicular first rib transection²
 - Most specifically used for vTOS and aTOS
 - Long-term anticoagulation use
- Chronic pain
 - Permanent nerve damage



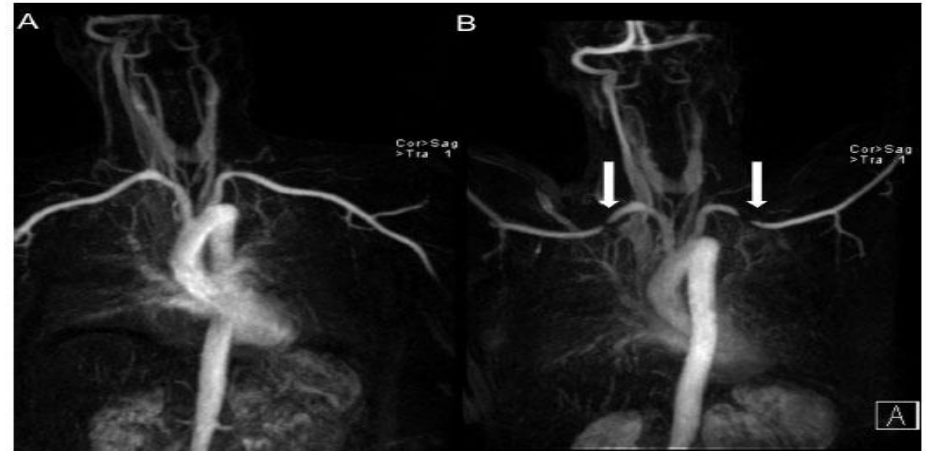
Tests

Upper - Quadrant Screen

- ROM
- Spurling's
- VBI
- Myotomes, dermatomes, reflexes
- Sensory testing
- Upper limb tension test

Other Tests:

- X-Ray
- Angiogram
- EMG



Case Study

➤ 29 y/o female s/p MVA 18 months prior

- Previously treated: 3 physicians, 2 PTs
 - Palliative modalities
 - Rigorous conditioning
 - No success & symptoms worsened
- Objective Findings:
 - 3 active myofascial trigger points
 - Restricted cervical spine ROM
 - GH joint limitations
 - TOS provocation maneuvers
 - (+) costoclavicular interval
 - (+) axillary interval
 - UE tension restricted with adverse neural tension signs

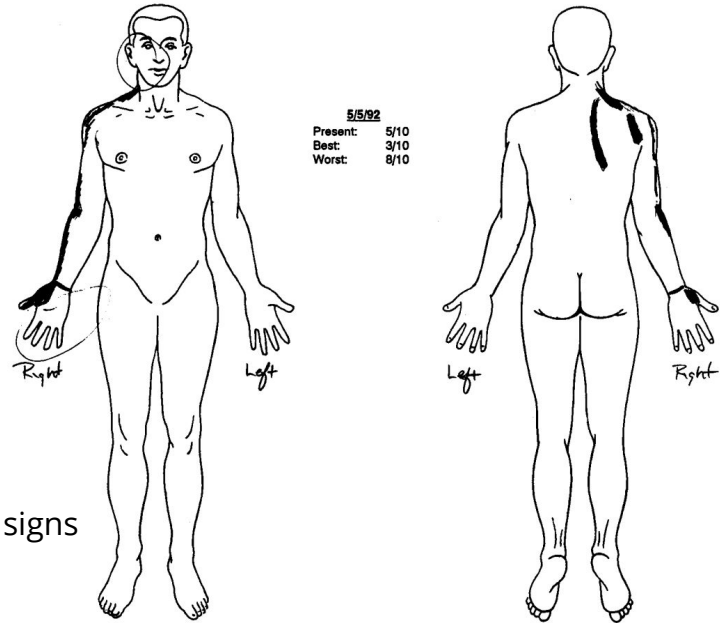


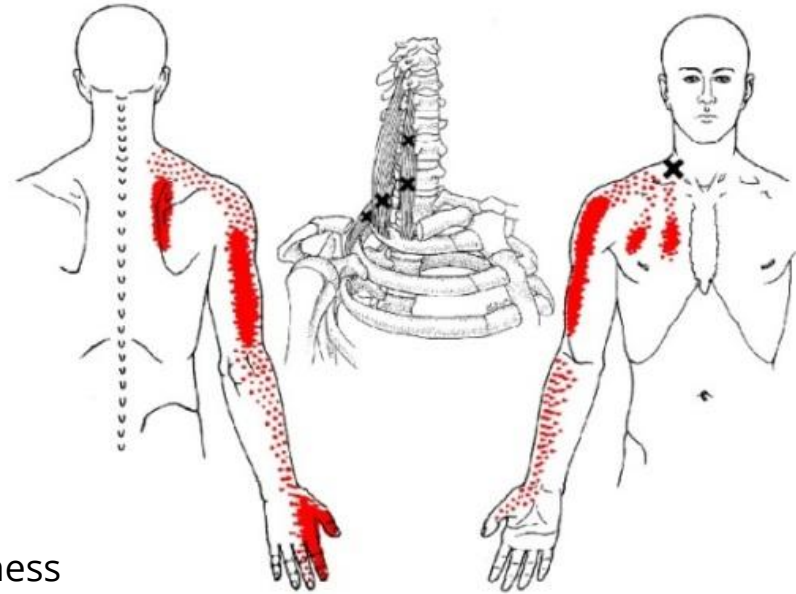
FIGURE 28 Cervicobrachial interval pain diagram

Case Study - Interventions

- First week of treatment (Stage I)
 - Decrease and control the patient's symptoms
 - Identify activities / position / treatments that exacerbate VS relieve the pain
 - Clear understanding of irritability level of the tissues
 - Formulate problem list based on assessment of systems and tissues involved
 - Prioritize based on pain control and comfort
- 2-3 weeks into treatment (Stage II)
 - Once control and comfort achieved
 - Treatment of soft-tissue and structural limitations
 - Soft-tissue mobilization
 - Nerve glides
 - Postural awareness and correction should be initiated
 - Conditioning and strengthening of muscles

Case Study - Treatment Plan

- Decrease painful symptoms (I)
 - Heat, US, STM
 - Low grade GH joint mobilization if appropriate
 - Diaphragmatic Breathing
- Address myofascial trigger points (I-II)
 - STM (ischemic compression, pin & stretch)
 - Trigger Point Dry needling
 - Ultrasound followed by stretching
- Improve posture (II-III)
 - Stretch and Strengthen
 - Neuromuscular Re-education, Postural Awareness
- Return to normal function (III)
 - Exercise Specific Overhead Reach
 - Functional Activities



Posture Training



Scapular Repositioning

- Standing or Supine
- 10 x 3 times a day



Overhead Mobility and Stability



- Rocking/Push Back
 - 3 x 12-15 daily as tolerated



- YTWA Sequence
 - 3 x 12-15 daily as tolerated

Case Study - HEP Stage 1



- Supine chin tucks
 - 10 x 3 times a day
- Supine pectoralis stretch
 - 30-45 sec hold 3 times a day (as tolerated)
 - Advance to ½ foam roll when appropriate
- Diaphragmatic Breathing
 - 1 x daily

Case Study - HEP Stage 2



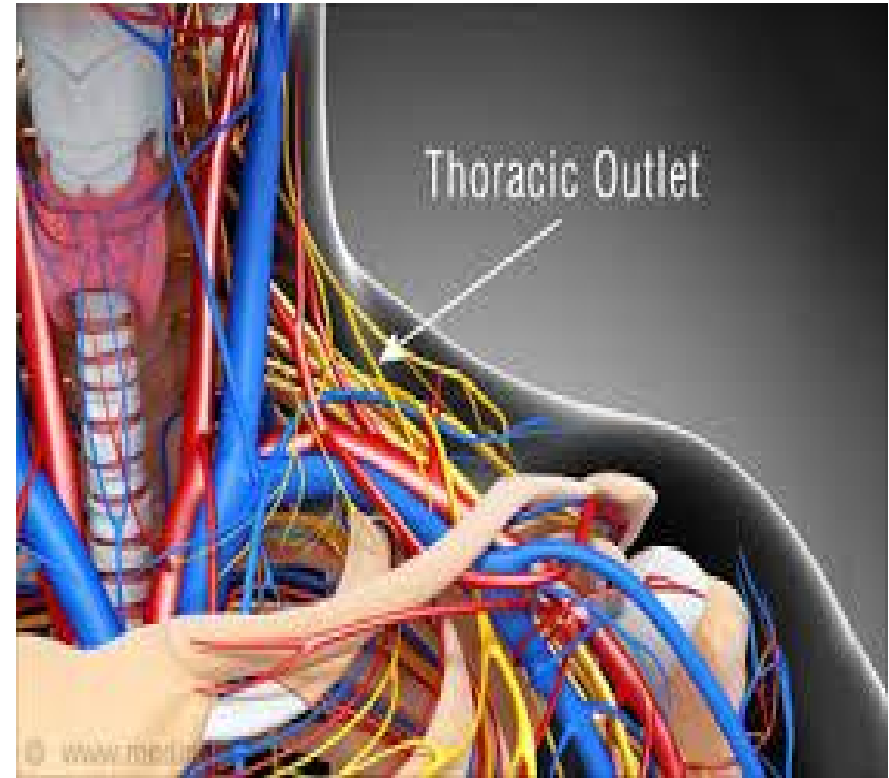
- Theraband Rowing (scapular retraction)
 - 10 x 3 times a day



- Chop (bilateral asymmetrical PNF)
 - 10 x 3 times a day

Take Home Message

- Extensive history to aid in diagnosis
 - Compression VS Entrapment
 - Differential Dx
 - Know when to refer
- Know the symptoms
- Consider the Anatomy
 - Sites of possible entrapments
 - Neurological and vascular anatomy
- Patient Education
 - Behavior modification
 - Postural awareness



References

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