Thoracic Outlet Syndrome (TOS): Shedding light on the TOS enigma

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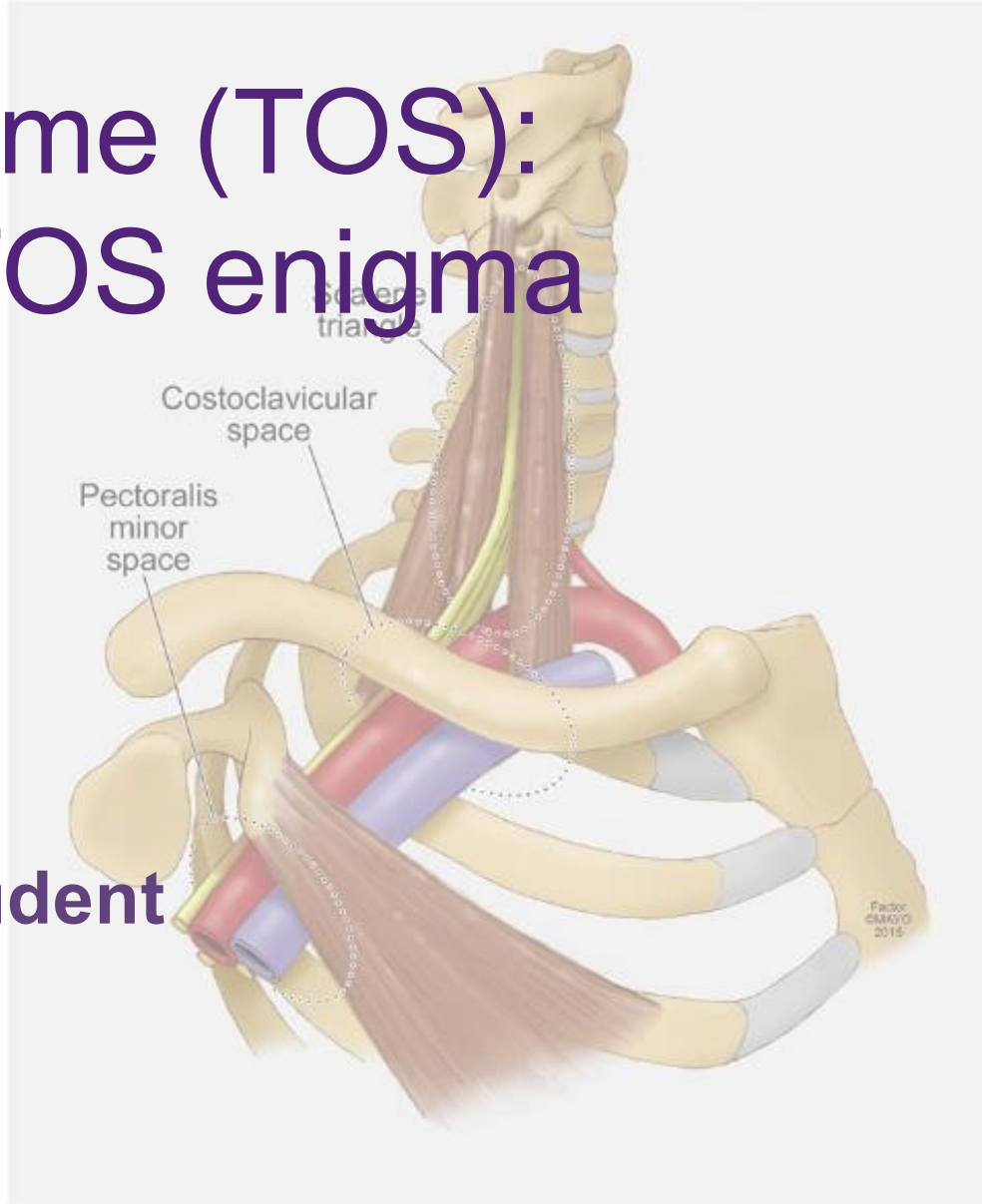
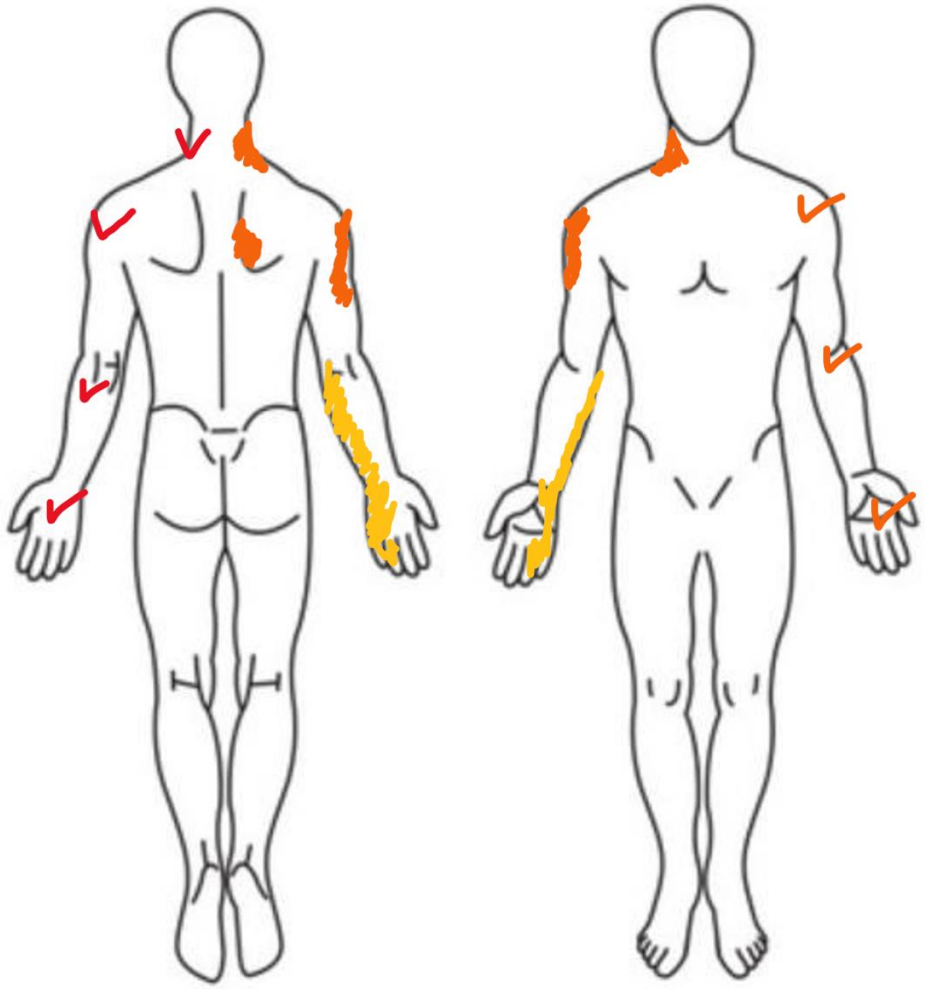


A Hypothetical Case



35yo Female with droopy shoulder, presenting with **pain over the neck, periscapular, and upper arm**
Paraesthesia in the medial elbow and hand
Aggravated by prolonged typing or brushing her hair

What differentials come to your mind?

- **Thoracic Outlet Syndrome**

Do I know enough about this Condition?

"NO!!"

Thoracic Outlet Syndrome (TOS): Shedding light on the TOS enigma

- **Classification of the TOS**
- **Differential diagnosis**
- **Special tests for the TOS**
- **Managements for TOS**

“Practical and applicable knowledge”

Classifications of TOS

Reporting standards of the Society for Vascular Surgery for thoracic outlet syndrome

Karl A. Illig, MD,[a] Dean Donahue, MD,[b] Audra Duncan, MD,[c] Julie Freischlag, MD,[d] Hugh Gelabert, MD,[e] Kaj Johansen, MD,[f] Sheldon Jordan, MD,[g] Richard Sanders, MD,[h] and Robert Thompson, MD,[i] *Tampa, Fla; Boston, Mass; London, Ontario, Canada; Sacramento and Los Angeles, Calif; Seattle, Wash; Aurora, Colo; and St. Louis, Mo*

(Illig et al., 2016)

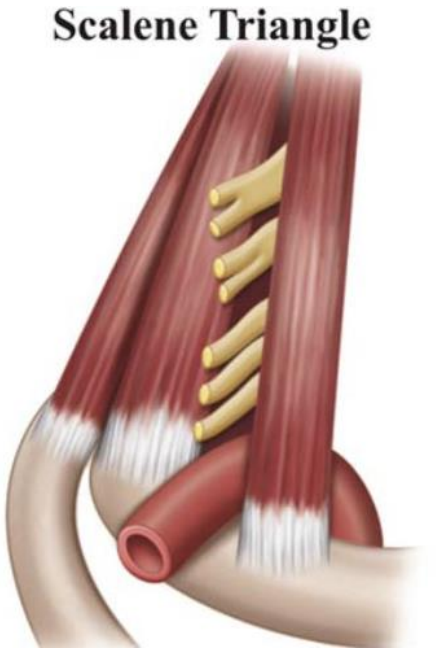
- **Arterial TOS**
- **Venous TOS**
- **Neurogenic TOS***

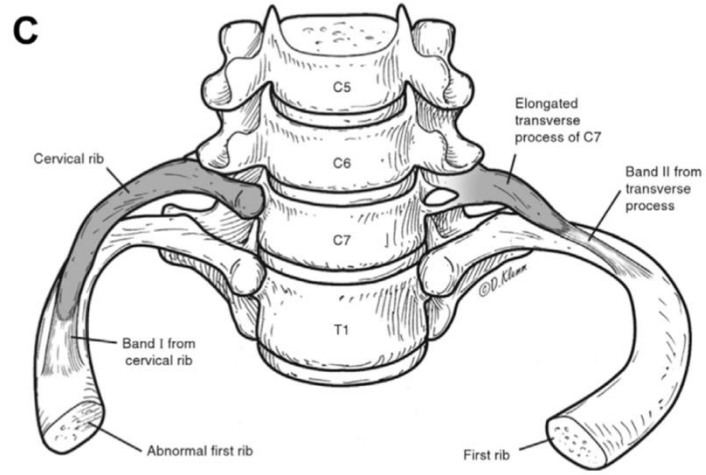
Arterial TOS

- **Subclavian Artery & interscalene triangle**
- **Pain (forearm/hand), Discolouration, temperature changes, swelling, and fatigue**
- **Aggravated by overhead position or arm activities**

(Illig et al., 2016)

Referral



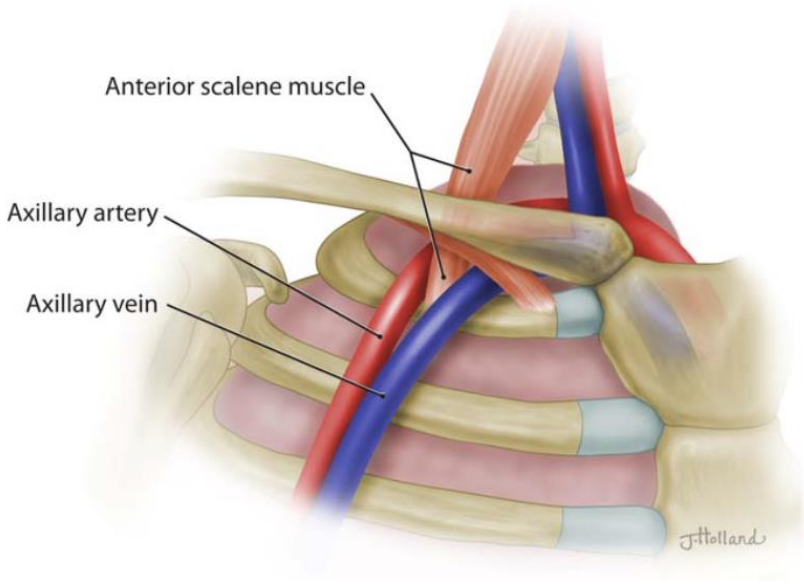


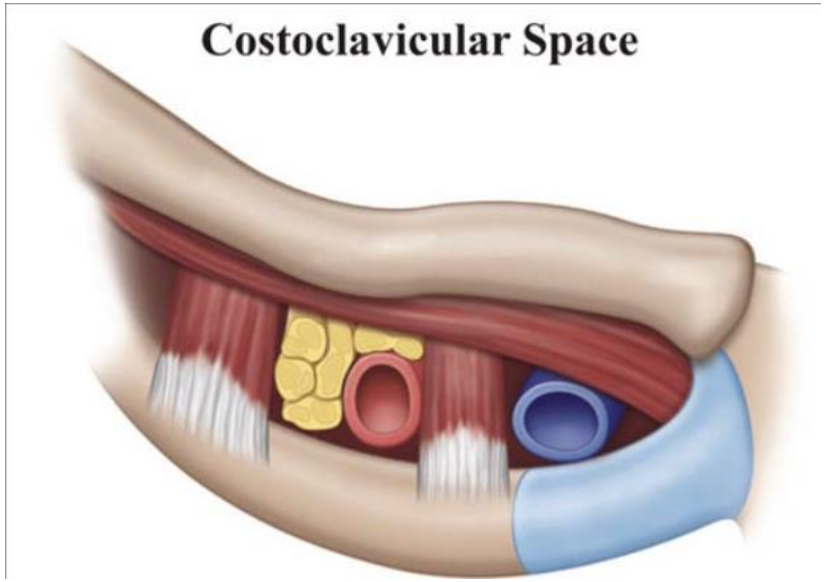
(Klaassen et al., 2014)

Venous TOS

- **Subclavian vein (Thrombosis)**
- **Costoclavicular space**
- **Discolouration (cyanosis), Temperature changes, Swelling, and Pain**
- **Collaterals and/or distention**
- **Aggravated by overhead position and repetitive arm use**

(Illig et al., 2016)





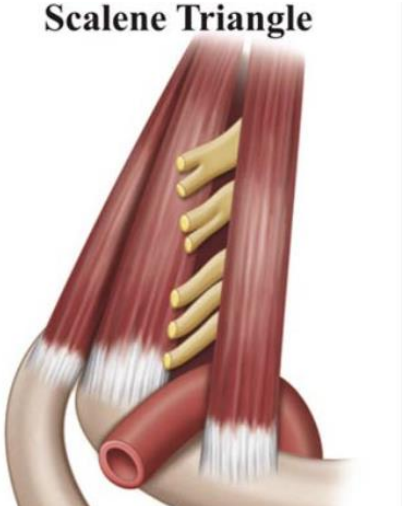
(Klaassen et al., 2014)

Referral

Neurogenic TOS

- **Chronic compression of Brachial Plexus**
- **Paraesthesia in arm, hand, and digits**
- **Pain over the head, neck, scapular, and upper arm**
- **Aggravated by overhead and/or repetitive arm use**
- **History of trauma and repetitive arm use.**
- **Clinical Tests**
- **Atrophy and weakness – Gilliat summer Hand**

(Illig et al., 2016)



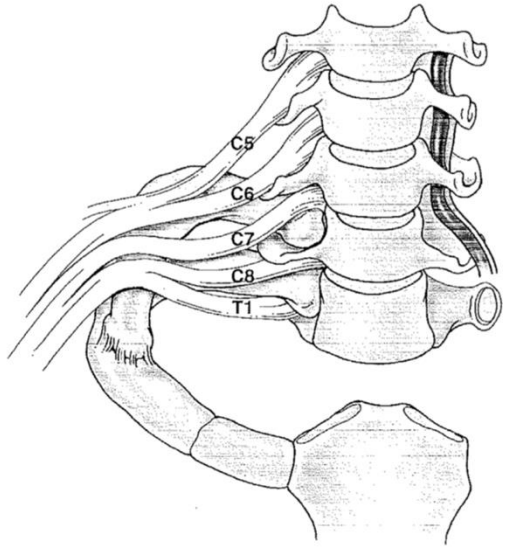


Fig. 6.
Anomalous cervical rib.

(Balderman et al., 2017)

(Klaassen et al., 2014)

Scapular Position

(Watson, Pizzari, & Balster, 2010)

- **Droopy Shoulder**
- **Traction – Mechanosensitivity**
- **Treatment Direction Test – Correction of the scapular position/movement**

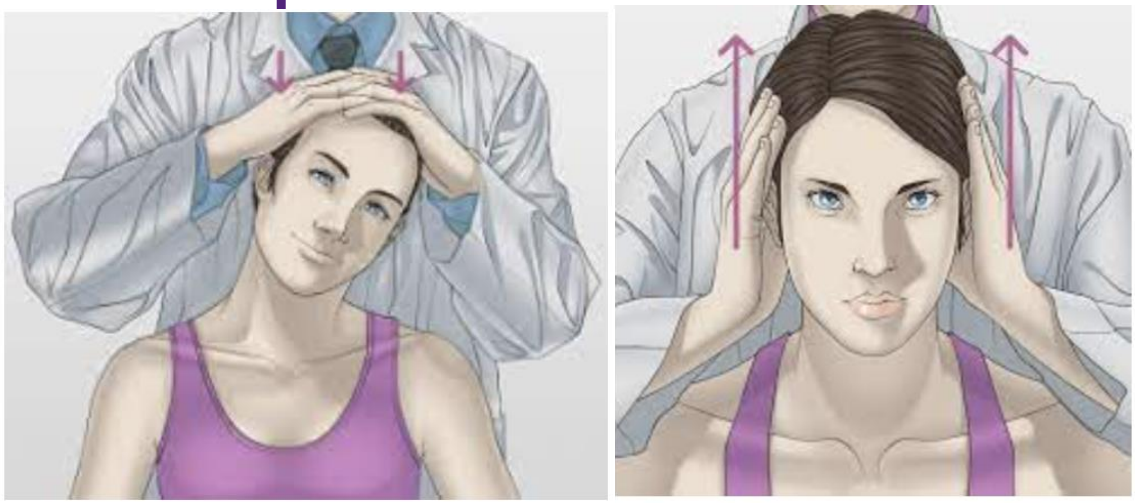
Differential Diagnoses

- **Cervical Vascular Pathologies – 5Ds 3Ns**
- **Craniocervical instability**
- **Visceral Referral, Infection, and systemic inflammatory conditions**
- **Tumours – Pancoast Tumour**
- **Myelopathy**
- **Vascular TOS – Vascular symptoms**
- **Peripheral neuropathy**
- **Radiculopathy/Radicular Pain***
- **Neurogenic TOS***

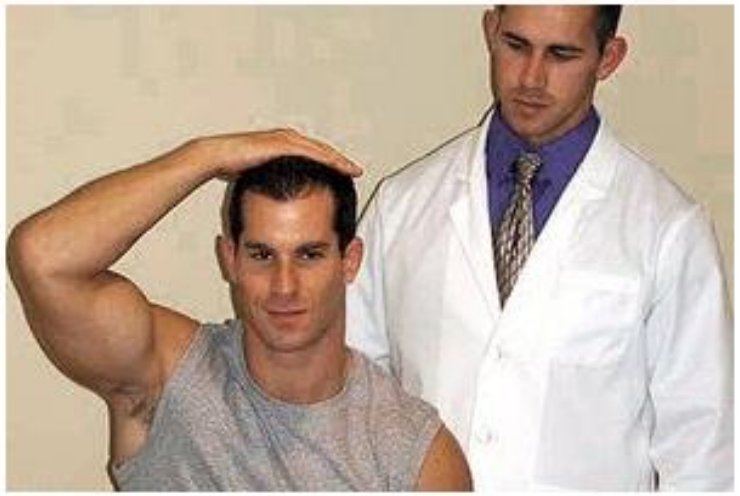
https://radiopaedia.org/articles/pancoast-tumour

Cervical Radiculopathy/Radicular pain

- **Cervical Impairments**
- **Spurling Test and distraction**
- **Overhead position**
- **?Multiple Levels**
- **Imaging**
- **TOS specific tests**



https://samarpanphysioclinic.com/taping-technique-for-neck-pain/



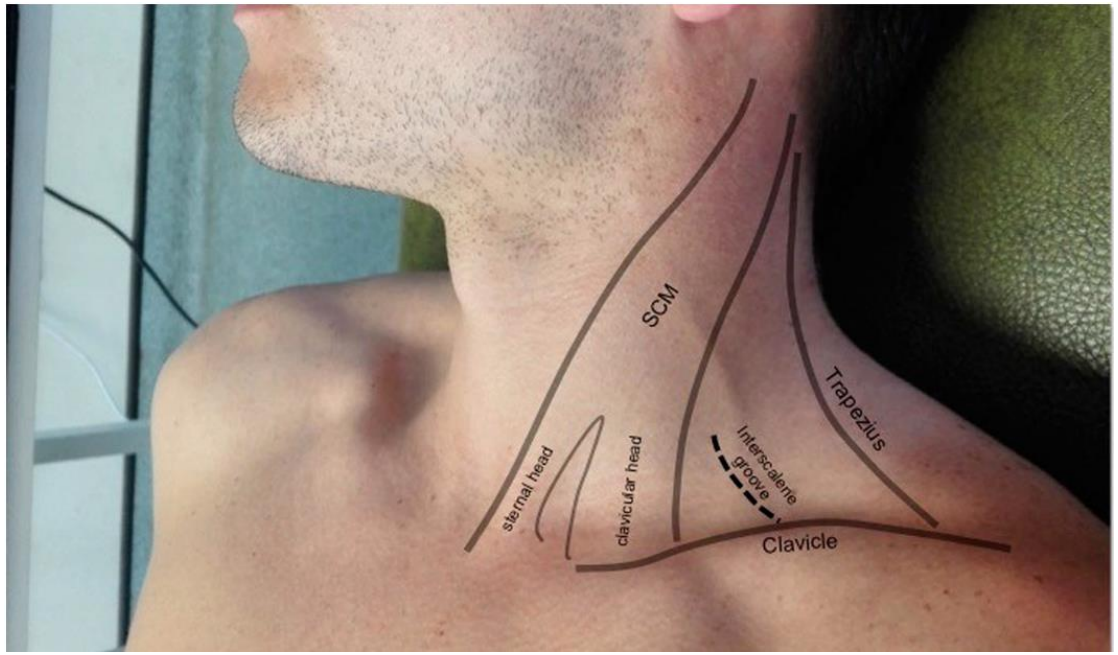
https://dynamicchiropractic.com/article/56851-the-shoulder-abduction-test-for-cervical-radicular-pathology

(Thoomes et al., 2018)

Clinical Examination

- Supraclavicular Palpation
- ROOS
- ULTT
- Adson
- Wright

Supraclavicular Palpation



Procedure:	• Pressure or percussion applied over the supraclavicular fossa
Positive signs:	• Reproduction of symptoms • Local tenderness
Rationale:	• Mechanical stress over brachial plexus
Diagnostic Values:	• Local Tenderness – 96% sensitivity • Reproduction of symptoms – 74% sensitivity (n=150)

(Balderman et al., 2017)

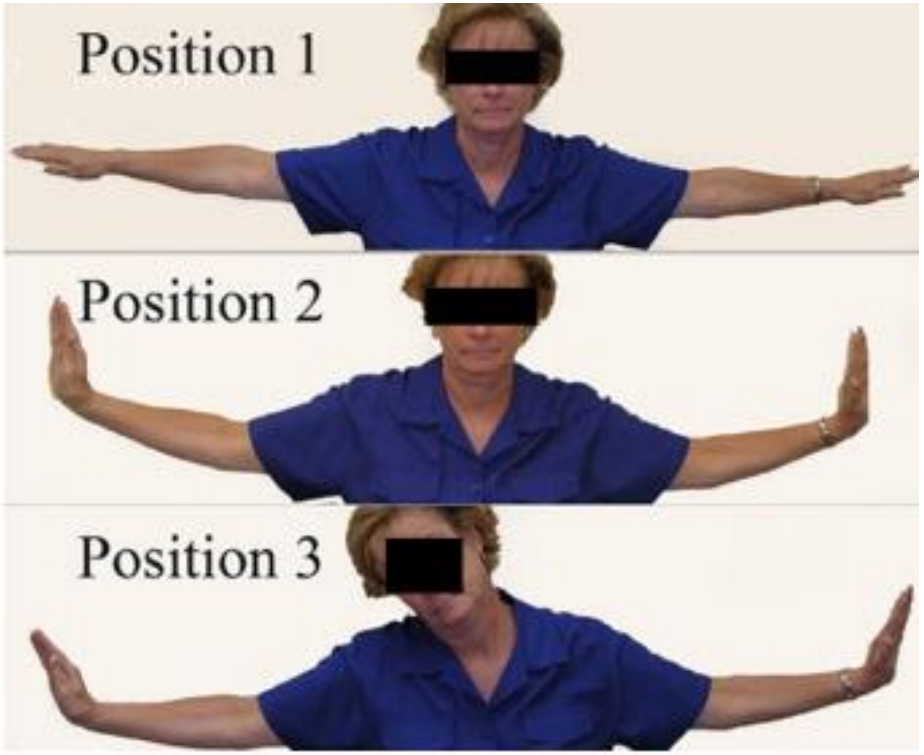
ROOS (Elevated Arm Stress Test)

Procedure:	• SH ER and Abd 90deg • Elbows bent to 90 deg • Open and Close your hands for 3 mins
Positive signs:	• Reproduction of symptoms
Rationale:	• Blood flow to the hand
Diagnostic Values:	• Sensitivity – 94% (n=150)

(Betancourt, Benrashid, Gupta, & McGinigle, 2024)

(Balderman et al., 2017)

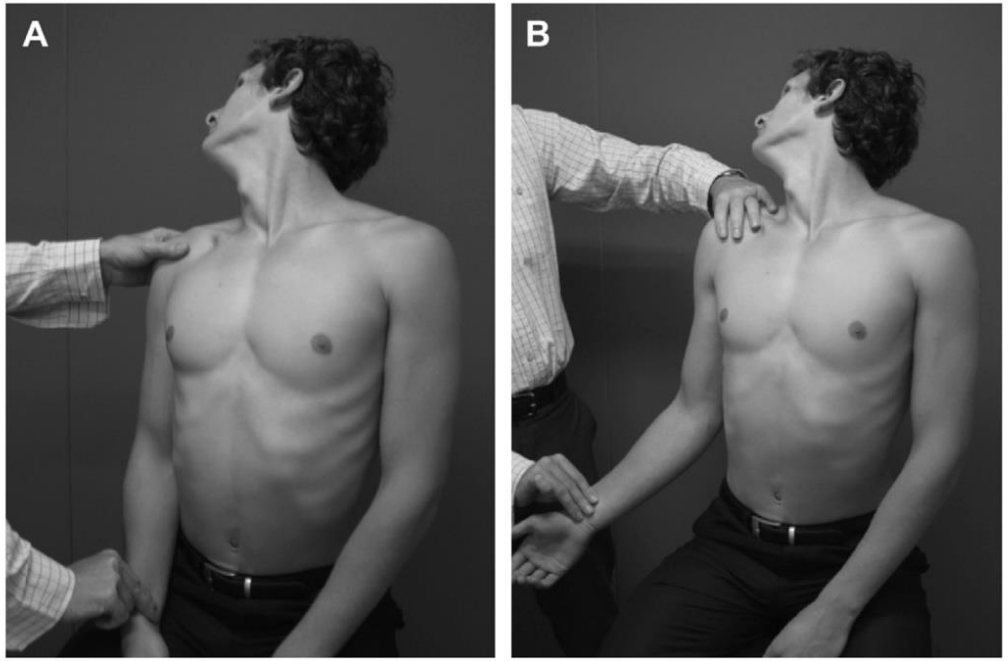
ULTT



Procedure:	• SH abd 90 deg elbows straight • Active wrist extension • Contralateral head tilting
Positive signs:	• Reproduction of symptoms
Rationale:	• Mechanosensitivity
Diagnostic Values:	• 85% sensitivity (n=150) • 98% sensitivity (n=50)

(Sanders, Hammond, & Rao, 2007)(Balderman et al., 2017)

ADSON



(Watson, Pizzari, & Balster, 2009)

Procedure:	• Rotation + ER (affected side) • Take a deep breath in • Hold for 30 seconds
Positive signs:	• Reproduction of symptoms • Reduced Pulse
Rationale:	• Stretch of the anterior scalene
Diagnostic Values:	• Sensitivity and specificity ~ 75%

(Gillard et al., 2001)

Wright's (or Hyperabduction) Test

(Watson, Pizzari, & Balster, 2009)

Procedure:	• Elbow at 90 deg flex • SH ER and ABD to 180 deg • Hold 1 min
Positive signs:	• Reproduction of symptoms • Reduced Pulse
Rationale:	• Subcoracoid space • But it can be any other spaces
Diagnostic Values:	• 90% sensitivity (symptoms) • Combined with Adson (pulse) – 94% specificity (n=48)

(Sanders, Hammond, & Rao, 2007)(Gillard et al., 2001)

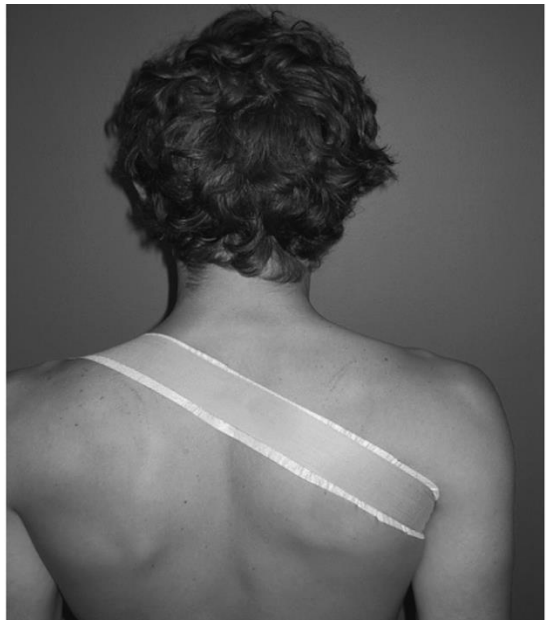
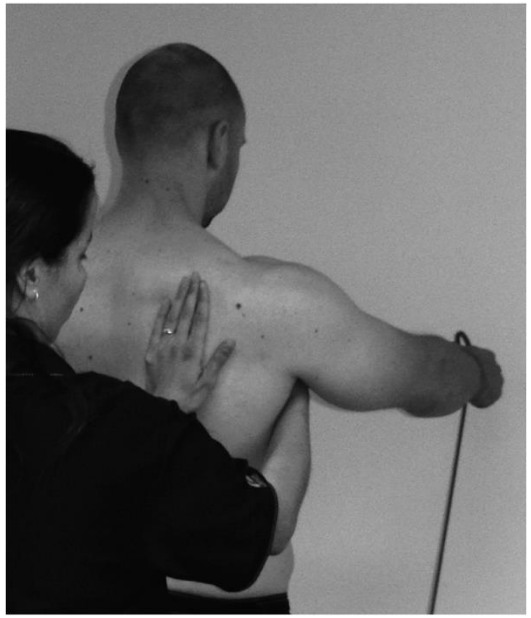
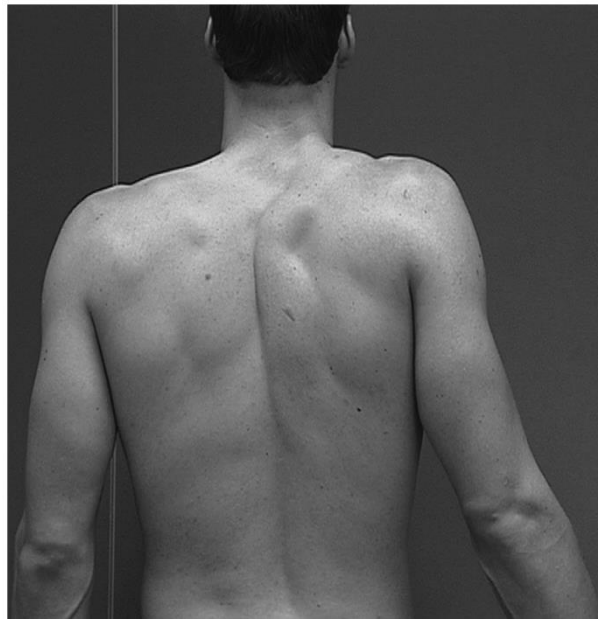
Summary

- **High sensitivity tests – rule out nTOS**
- **Cluster of clinical tests (including Adson) – raise specificity (Gillard et al., 2001)**
- **The best we have got and still suggested by vascular surgery society (Illig et al., 2016)**

Management

- Physiotherapy for nTOS
- Surgery and Injection

Scapular focused interventions

(Watson, Pizzari, & Balster, 2010)

- **Scapular setting - Taping**
- **Add shoulder movements and load**
- **Target the weakness**

Other Interventions

- **Stretching – scalene and pec minor**
- **Manual therapy – cervical, 1st rib, thoracic spine, and muscles.**
- **Neurodynamics – mechanosensitivity**

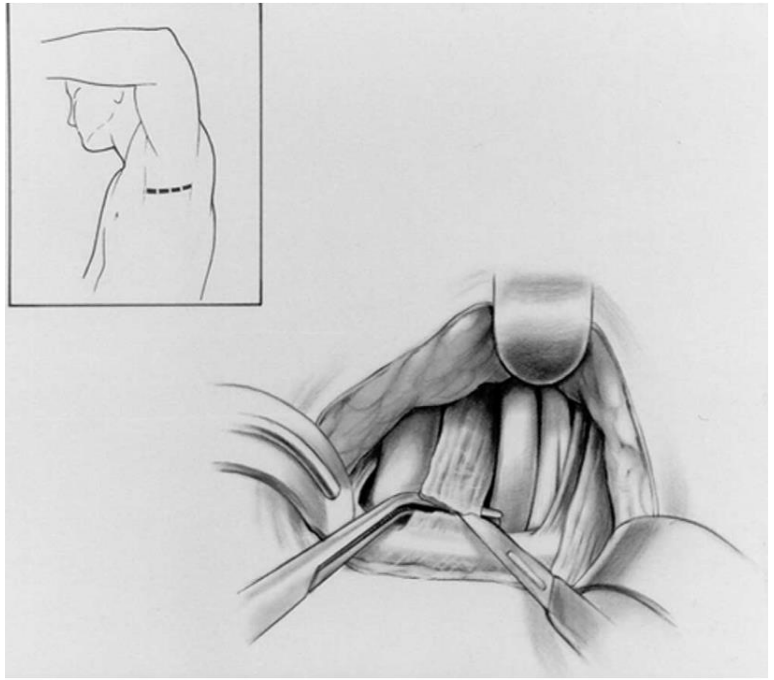
Justify your interventions based on the clinical findings

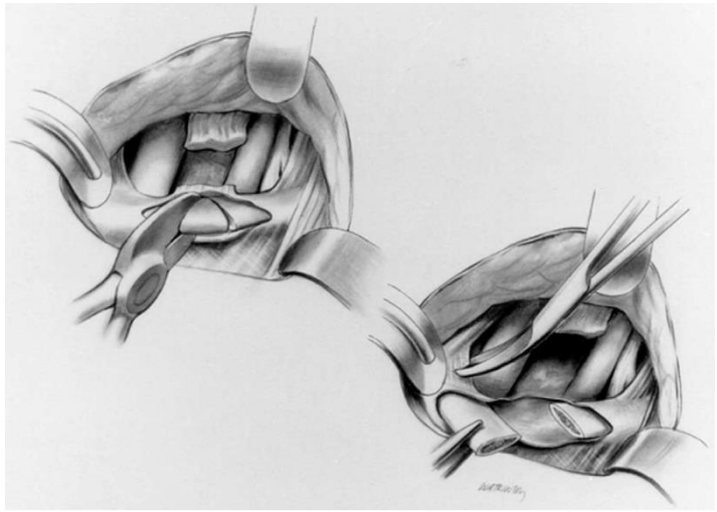
(Ahmed et al., 2022)

Medical Interventions

- **Botulim Toxin Injection – Anterior/middle Scalene, Subclavius, and Pec minor.**
  - A SR including 8 studies (n=497) (Kök et al., 2023)
  - “BTX may provide short-lasting symptom relief in some neurogenic TOS patients”

- **Surgery – RCT (n=50) (Goeteyn et al., 2022)**
  - Transaxillary Approach vs physiotherapy program
  - 1st rib resection + scalenectomy + neurolysis + pec minor tenotomy
  - Surgery > Physiotherapy for refractory nTOS





(Urschel, 2005)

Take Home Messages

- **Exclude other conditions**
- **TOS – Cluster of the clinical tests**
- **Impairments – i.e., scapular control or orientation**
- **Consider the patient as a whole person**
- **Injection and surgery are the options**

Thank You

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