Thoracic Outlet Syndrome

Physical Therapy Examination & Intervention
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Thoracic Outlet

• Triangular space between the anterior scalene anteriorly, middle scalene posteriorly and first rib inferiorly
• The brachial plexus passes through at the root (C5-T1) and trunk level & subclavian artery
• Subclavian vein and lymphatic vessel pass anterior to anterior scalene
TOS Anatomy
Subcoracoid tunnel
Brachial Plexus

- Roots
- Trunks
- Divisions
- Cords
- Branches
Signs & Symptoms

• Local lateral neck or chest pain

• Upper Extremity:
  – Pain
  – Paresthesia
  – Muscle weakness
  – Diminished blood flow
  – UE may be swollen, cold, blue
Rule out

- Cervical disc
- Cervical OA
- Peripheral nerve entrapments
- CNS involvement
- Shoulder pathologys
- Raynauds
Types of TOS

- First Rib Syndrome
- Scalene Syndrome
- Costoclavicular Syndrome
- Pectoralis Minor Syndrome
First Rib Syndrome

• Elevation of the first rib resulting in pressure on the lower nerve roots & trunks of brachial plexus and vascular structures
• Paresthesia will primarily be in the C8, T1 regions (medial arm, forearm & hand)
• Muscle weakness C8, T1 muscles (thumb ext, FDS, FDP, finger abd/add)
• Possible edema, cold extremity, diminished pulse
Scalene Syndrome

- Hypertrophy of the scalenes resulting in pressure on the upper nerve roots

- Paresthesia primarily in C5, C6 regions (lateral arm, forearm & hand)

- Muscle weakness primarily C5, C6 (shoulder abd, ER, scapula retractors)
Costoclavicular Syndrome

- Retraction of the clavicle compressing the clavicle against the first rib and compressing the subclavian vein & lymphatics, and possibly the anterior scalene effecting all or some of the nerve roots
- Edema, cold extremity, pain, paresthesia
Pectoralis Minor Syndrome

- Tightness of pec minor compressing the cords & branches (terminal nerves) of brachial plexus and vascular supply
- Pain paresthesia to any or all regions of the UE
- Muscle weakness to any except nerves that have already come off
- Diminished blood flow – edema, cold extremity
Other sources of TOS

• Cervical rib – rib attached to C7 or extra long transverse process of C7

• Fibrous bands from C7 to first rib

• Clavicle or first rib fractures
Cervical Rib
Fibrous Bands
First Rib Fracture
Clavical Fracture
Surgical Interventions

- Resection of first rib
- Resection of cervical rib
- Scalenectionomy – anterior and/or middle
History of TOS Patient

• Trauma or unknown etiology
• Pain and paresthesia of upper extremity
• With or without cervical pain

• Swimmers, weightlifters, quadrapalegics, CP, CVA, cervical trauma, poor posture
Examination

- Postural exam
- Upper Quarter Screen
- Cervical exam
- Special tests
Upper Quarter Screen

- Document any:
- Sensory deficits
- Motor deficits
- Reflexes
- Diminished ROM – cervical, thoracic, shoulder
Special Tests

- Hyperabduction test
- Roo’s test
- First rib spring test
- Scalene cramp test
- Military test
- Wrights maneuver
- Adson’s test
- Palpation of scalenes
Hyperabduction Test

• Patient in sitting
• Holds arms in shoulder abduction and external rotation (1 min)
• Examiner palpates radial pulse
• + diminished or occluded pulse &/or reproduction of distal symptoms
Hyperabduction Test
Roo’s Test

- Patient in sitting
- Holds arms in shoulder abduction and external rotation then rapidly open and close hands (1 min) (3 min)?
- + reproduction of distal symptoms
Roo’s Test
First Rib Spring Test

• Patient supine with head SB toward side being tested
• Press down into first rib (toward opposite hip)
• + increase distal symptoms or decrease distal symptoms
First Rib Spring Test
Scalene Cramp Test

• Patient in sitting - turn head to side being tested and pull chin toward clavicle contracting scalenes

• + reproduction of distal symptoms
Scalene Cramp Test
Military Test (costoclavicular)

- Patient in sitting
- Patient is asked to maximally retract scapula and hold (1 min)
- Examiner palpated radial pulse
- + change in pulse, hand appears blue, or reproduction of paresthesia
Military Test
Wrights maneuver

- Patient in sitting
- Patient abducts and externally rotates shoulder
- Examiner palpates radial pulse
- + reproduction of paresthesia and/or diminished pulse
Wright’s Maneuver
Wright’s Maneuver
Wright’s Maneuver
Adson’s Test

- Patient in sitting
- Patient asked to take a deep breath and hold, extend cervical spine and side bend toward side being tested
- Palpate radial pulse and have patient abduct and externally rotate UE
- + diminished pulse and/or reproduction of paresthesia
Adson’s Test
Adson’s Test
Palpate Scalenes

- Scalenes – posterior to clavicle & SCM, on top of first rib then have patient take short breaths
Palpate Scalenes

adapted from
Interventions

• Mobilization of first rib

• Scalene stretch

• Pectoralis minor stretch

• Postural correction exercises
Mobilize First Rib

- Patient supine with head side bent toward effected side
- Press first rib inferior toward opposite hip
- Low grades or high grades?
Mobilize First Rib

• Highly Irritable – low grade gentle oscillations

• Stiff & Tight – higher grade oscillations or sustained hold

• Stuck in elevated position - thrust
Mobilize First Rib
Self Mobilization 1st Rib
Scalene Stretch

• Hold first rib down

• Side bend head away

• Don’t loose hold on first rib
Scalene Stretch
Scalene Stretch
Pectoralis Minor Stretch

• Patient supine

• Hold down ribs 3-5

• Push scapula posteriorly
Pectoralis Minor Stretch
Pectoralis Minor Stretch
Interventions

• Interventions also need to address:
  • Postural deficits
  • Cervical & Thoracic spine ROM deficits
  • Shoulder complex ROM deficits
Postural Correction Exercises

• Especially in sitting address:

• Forward head
• Protracted scapula
• Thoracic kyphosis

• Work station corrections
• Questions?