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Thoracic Outlet Syndrome Assessment and Physical Therapy Interventions

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Objectives

As a result of this course, participants will be able to:

Identify at least three clinical patterns of Thoracic Outlet syndrome.

Differentiate between vascular and neurogenic clinical presentations of Thoracic Outlet Syndrome when possible.

Implement clinical decision making in choosing if a patient is appropriate for physical therapy for intervention for Thoracic Outlet Syndrome.

Describe at least two case studies to illustrate the clinical decision-making process in evaluating if the type of Thoracic Outlet syndrome is vascular or neurogenic in origin.

Outline at least two treatment plans to improve symptoms from Thoracic Outlet Syndrome.
Question 1

How often do you evaluate a patient with thoracic outlet syndrome?

- A. more than 5 in a month
- B. more than 10 in a month
- C. less than 5 in a month
- D. all the time

Question 2

In the patients that you treat for thoracic outlet syndrome, what is the most likely cause of their symptoms?
What is TOS?

- THORACIC OUTLET SYNDROME (TOS) is a disabling symptomatic condition that arises from injury to nerves of the brachial plexus and the subclavian vessels as these structures pass from the neck and thorax into the upper limb.
- The condition usually presents with:
  - Pain
  - Fatigue
  - Deep muscle aching

aka

- Sclaneus anticus
- Costoclavicular
- Hyperabduction
- Cervical rib
- First rib syndromes

- Peet et al first described TOS in 1956
Question 3

- What type of TOS do you feel you most commonly treat in your patients that have a diagnosis of TOS?

4 related clinical syndromes of TOS

- Arterial compression
- Venous compression
- Neurogenic compression
- Poorly defined pain syndrome
Retrospective review says...

- 423 pts that received surgery for TOS between 2003-2011
  - 22 had nTOS (13 female, 9 male, mean age 25) 37 m post dx
  - All 22 had neurogenic symptoms
    - 15/22 (68%) had regular arm discoloration (paleness & rubor on exertion)
    - 9/22 (41%) had an infraclavicular bruit w/UE abduction
    - 2/22 (9%) had a hx of embolization
    - 6/22 (27%) had a cervical rib
    - 3/22 (14%) had an abnormal first rib
    - 2/22 (9%) had venous thrombosis + arterial symptoms
    - 3/22 (14%) had bilateral symptoms
nTOS

- 95% of all patients with TOS
- Wide & vague spectrum of symptoms
  - Arm discomfort/pain
  - Paresthesias of the medial hand & forearm
  - Weakness & atrophy of thenar (& intrinsics: rare)

- Often related to history of trauma, particularly neck hyperextension injury, repetitive work, vocational or sports overuse injuries
nTOS

- Gillatt et al first described nTOS in 1970 based on EMG testing
- Now, nTOS dx is based on subjective hx & exam

Differentiating clinical patterns of TOS
Arterial TOS

- Involves subclavian or axillary arteries
- Makes up 1% of TOS cases
- Least common but most concerning as it causes ischemic complications
- Potential sites of subclavian/axillary artery compression within the thoracic outlet include:
  - scalene triangle (A on next slide)
  - costoclavicular space (B on next slide)
  - subcoracoid space (C on next slide).
- Other sites of compression outside the thoracic outlet include the humeral head (D) and the quadrilateral space (E).
Acquired aTOS

- Overhead athletes
- Weightlifters
- Baseball athletes
- Aquatic athletes

- All are subject to compression due to muscle hypertrophy or repetitive motions

DD of aTOS

- Vascular
  - Arteriosclerosis
  - Vasculitis
  - Vasospastic disorder
  - Raynaud dz
  - Acute coronary syndrome

- Musculoskeletal
  - Subacromial impingement
  - Rotator cuff tear
  - Adhesive capsulitis

- Neurologic
  - C-spine radiculopathy
  - Ulnar neuropathy
  - CTS
  - Brachial plexitis
  - MS

- Misc
  - Pancoast tumor
  - Trigger points
  - Fibromyalgia
  - CRPS
History

- Potentially may include a neck injury
- Time period of strenuous work or athletic activity performed at shoulder height or above
- Posture requiring repetitive lateral flexion
- Previous clavicle fracture
- Cervical rib

History

- Potentially angina & dull arm ache with numbness or discomfort
  - Worse with activity, improves w/rest
- Headaches
- Brachial plexus injury
- Cervical or thoracic DDD
- Apical area of the lung or chest wall abnormality
aTOS progression

- Commonly, dull ache that worsens with activity, improves w/rest (exertional pain)
- Progresses to cyanosis or pallor of the UE
- Early fatigue or dead arm sensation
- Rarely has weakness or sensory deficit

Examination

- No pathognomonic signs for aTOS
- BP changes (20 mmHg)
- Loss of radial pulse w/elevation
- Digital ischemia in an embolic pattern
- Exam must include MSK, nervous, & vascular systems
Examination

- **Observation**
  - Asymmetry
  - Atrophy
  - Abnormal posture
  - Scapular dyskinesia
  - Skin or nail color changes
- **Palpation**
  - Tenderness
  - Cervical rib

Examination

- **Vascular**
  - BP Bilaterally w/limbs akimbo & with UE abducted
  - Radial pulse w/limbs akimbo & UE abducted
  - Systolic bruit w/abduction
- **ROM**
  - Neck & shoulder AROM & PROM
- **Strength**
- **DTR’s**
Question 4

What assessment tools do you most commonly use to evaluate if a patient has TOS and do you think it is useful to differentiate the type of TOS?

Special tests

Adson’s test video
Special tests

- Halstead's test video

Special tests

- Allen's test video
Special tests

- Roos test video

Special tests

- Supraclavicular stethoscope placement video
Which test to use?

- Halstead’s test?
- Adson’s test: Specificity ranging from 18% to 87%, & sensitivity of up to 94%
- Roo’s test: Sensitivity: 84%, Specificity: 30% PPV: 68% & NPV: 50%
- Allen’s test: Martin et al 2000, sensitivity of 73.2% and a specificity of 97.1%. Potentially a good and valid screening test for blood supply of the hand.

Question 5

- Do you think posture plays a role in your patient’s c/o thoracic outlet syndrome?
- If so, how?
Differential Diagnosis of conditions like TOS

Role of posture?
DD: Pancoast vs. TOS

- Tumors typically invade the lower trunks of the brachial plexus
- Resulting in C8 & T1 nerve root compression may lead to significant disability and loss of hand function.
- Compression into the paravertebral sympathetic nerves results in:
  - Horner’s syndrome, which consists of enophthalmos (backward displacement of the eye), ptosis (drooping eyelid), and miosis (pupil constriction).

Pancoast tumor
T4 syndrome  Conroy & Schneiders, MT 2005

- Unilateral or bilateral glove & stocking distribution of paraesthesia
- Pain at night or early AM in UE’s and thorax with no neuro signs
- Often found in sedentary repeated, flexed/stooped seated posture (occupational hazard!)

Hyperkyphosis in the t-spine

- Excessive anterior curvature in the t-spine.
- Longitudinal cohort studies have reported an increase in total # of fractures over 4 years.
- Katzman et al reported on 3,038 women finding for each 10 degree increase in kyphosis angle there was a 22% increase in annualized rate of incident of vertebral fracture
Costochondritis

- Refers to pain in the costochondral articulations w/o swelling.
- Over 40 & female
- Tends to affect the 2nd, 3rd, 4th & 5th costochondral joints
- Trauma or repetitive motion in their history
- Sharp pain along sternum; burning sensation.

Tietze syndrome

- Sudden or gradual onset of upper anterior chest pain
- Pain/tenderness of costochondral joint(s)
- Bulbous swelling of the involved costal cartilage
- Mild to severe chest pain that may radiate to the L shoulder & arm
- Pain aggravated by deep breathing, recumbency, or exertion
Slipped rib syndrome

0 Most common in the lower ribs with hypermobility
0 Common in middle aged years
0 Pain is worse with slump sitting or Sbng to affected side
0 Anterior ribs sublux, impinging on intercostal nerve...ouch!!

Scheuermann disease

0 Most common causes of structural spinal hyperkyphosis in adolescents
0 2 types have been described
   0 Thoracic
   0 Thoraco-lumbar

0 Diagnosis is based on clinical and radiological presentation
Scheuermann disease

- Manifests as vertebral wedging, endplate irregularity, diminished anterior vertebral growth, Schmorl’s nodes, narrowing of the IV disk spaces & premature disk degeneration

- SD is most common between the ages of 12 and 15
Paget Schroetter syndrome

- Effort thrombosis from chronic injury and compression of the subclavian vein between the clavicle and first rib and nearby subclavius tendon increases the risk

- Frequent syndrome in young competitive athletes

Interventions
* Initial consultation includes: history and physical exam, duplex ultrasound and occasionally other imaging studies such as MRI or CT. Duplex ultrasound is done with arterial plethysmography, which can document with provocative maneuvers the obliteration of waveforms suggestive of a narrowed thoracic outlet.
Interventions

Cools et al 2007
nTOS

Mean QuickDaSH Scores for nTOS Athletes

- Surgical
- Non-Operative

- Initial: 43.4
- Post-PT: 37.4
- 6 month Post-Op: N/A
- Follow-up Survey: 5.5
- Final: 9.9

nTOS & PSS outcomes

Full Return to Sport

- All Patients: 85%
- nTOS: 82%
- PSS: 93%

- NO: 15%
- NO: 7%
- Yes: 85%
- Yes: 93%
- Yes: 93%
Case studies

- 28 y/o dental hygienist w/RUE paresthesia's & arm pain

- 18 y/o baseball pitcher w/RUE fatigue, tingling & pain

Any questions??