Thoracic Outlet Syndrome

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Thoracic Outlet Syndrome

- No Disclosures
Thoracic Outlet Syndrome

- Constellation of signs and symptoms caused by compression of the neurovascular structures in the thoracic outlet
- Brachial plexus, subclavian vein, and subclavian artery
Thoracic Outlet Syndrome (TOS)

- **95%** Neurogenic (Brachial Plexus)
- **3%** Venous (Subclavian Vein)
- **2%** Arterial (Subclavian Artery)
Pathophysiology

- Previous head, neck or upper extremity trauma:
  - Scapula inflammation r/t trauma, fibrotic reactions r/t muscle spasm, abnormal osseous structure

- Low grade repetitive trauma

- Age related postural changes

- Congenital variations of costoclavicular space
Diagnosis

- Pattern recognition-thorough patient interview:
  - History
  - Symptoms
  - Posture

- Physical Exam:
  - TOS maneuvers

- Diagnostic studies:
  - Exclude other entities-median nerve compression, degenerative disc disease, frozen shoulder, rotator cuff tear, osteoarthritis, fibromyalgia
Predisposing Factors

- Cervical rib-95% of TOS patients
- Rudimentary first rib
- Congenital narrowing of scalene triangle
- Enlargement of scalenus muscle from heavy lifting
- Congenital bands
- Narrowing of costoclavicular space
- Sagging shoulders and heavy breasts-poor body alignment
Clinical Presentation

- Young and active (between ages 20 and 40 years of age)
- Men = Woman
- Abnormal osseous structures—history of trauma or congenital
- Chronic nature, extensive collateralization
- Claudication with exercise
- Pain to shoulder/arm/hand, cramps, coldness, cyanosis and heaviness
Initial Assessment

- Evaluate extent of the patient's disability
- Activities that exacerbate symptoms
- Activities required in workplace
- Expectations for continuing returning to work or physical activity
Physical Exam

- Assess patient posture
- Assess for swelling, edema, discoloration of subcutaneous vein distention
- Evaluate hands of muscle atrophy and weakness of grip
- Assessment of ROM of upper extremities, neck (head-lilt)
Physical Exam

- Identify extent of scalene/pectoralis minor muscle spasm-supraclavicular/infraclavicular palpation
- Identify trigger points in supraclavicular space:
  - Assess for focal tenderness or palpable deformity
- Peripheral nerve exam:
  - Rule out ulnar nerve entrapment, carpal tunnel syndrome-Tinel’s sign, Phalens maneuver
- Provocative maneuvers-Adson, EAST, Upper Limb Nerve tension test:
  - Assess for white hand sign
Adson Maneuver

- Deep inspiration and turning of the neck away from the affected extremity - elevates 1st rib and narrows interscalene triangle

- Disappearance/reduction of radial pulse, pallor, cooling sensation, numbness, pain is positive-bruit can be heard in ATOS

- Associated but NOT diagnostic of TOS
Elevated Arm Stress Test (EAST)

- 90/90 degree “surrender” position
- Rapidly alternate opening and closing hand for at least 3 minutes
- NTOS patient often reports symptoms at 20-30 seconds and cannot complete exam past 60 seconds
Upper Limb Nerve Tension Test

- 90 degrees of abduction from trunk
- Reproduction of symptoms with wrist extension, with some relief with wrist flexion
- Frequent finding in NTOS
Diagnostic Tests

- **Chest x-ray:**
  - Rule out osseous cervical rib, anomalous first rib, abnormally wide transverse process of cervical vertebrae, DDD, or shoulder joint pathology

- **CT, MRI, EMG/nerve conduction studies often negative:**
  - Serve to exclude other conditions i.e. nerve compression syndromes, cervical radiculopathy, nerve injury, DDD

- **Arteriography and Venography with POSITIONAL MANEUVERS**

- **Segmental pressures (WBI) with POSITIONAL MANEUVERS-arterial TOS**
Neurogenic TOS – 95% of TOS

- Compression of the brachial plexus nerve roots (C5 to T1)
- Often diagnosed by exclusion of other conditions
- Most patients will improve with conservative management
- Progressive disability, ineffective treatment, and/or inability to work may require further intervention
Neurogenic TOS (NTOS) Symptoms

- Hand or arm pain
- Positional discomfort
- Numbness - often in ulnar distribution-C8 and T1 cervical nerve compression
- Weakness - in elevated positions
- Headache – occipital region:
  - Secondary to spasm in trapezius and paraspinal muscles
  - Tension in neck or back
  - Spasm often caused by inadvertent alterations in posture
NTOS Symptoms (cont.)

- Exacerbated by:
  - Elevation of arms or hands
  - Reaching for objects overhead
  - Lifting
  - Prolonged typing
  - Driving
  - Speaking on the telephone
  - Shaving, combing or brushing hair
Venous TOS (VTOS) – 3% of TOS

- Paget-Schroetter Syndrome
- Compression and repetitive injury of the subclavian vein
- Excessive arm activity
- Compressive element: lateral insertion of costoclavicular ligament
Venous Symptoms

- Effort thrombosis AKA Paget von Schroetter syndrome:
  - DVT in young, healthy adults with no hypercoagulable disorder

- Hand and arm edema

- Cyanosis

- Pain especially with abduction or hyperextension

- Forearm fatigue

- Enlarged subcutaneous collateral veins
VTOS

- Young (20-30 year olds)
- Healthy
- Active
- Do not want limitations in exercise
- Do not want multiple re-interventions
- Do not want anticoagulation
Arterial TOS (ATOS) – 2% of TOS

- Caused by compression of the subclavian artery:
  - Leads to development of SCA occlusion, aneurysms, and/or intimal hyperplasia
  - Complicated by distal thromboembolism, hand/digit ischemia
- Acute upper extremity ischemia requires immediate surgical treatment and anticoagulation
Arterial TOS (ATOS) Symptoms

- Digital or hand ischemia
- Cutaneous ulceration or emboli
- Forearm claudication or exertional fatigue
- Cold/pale fingers
Difficult Diagnosis

- Diagnosis remains difficult, confusing, & elusive
- Progressively disabling symptoms:
  - Vasospasm, disuse edema, & hypersensitivity
- Multiple physician consultations
- Partial or ineffective treatment
- Medicolegal issues
- Patients often frustrated
NTOS Treatment

- Physical Therapy:
  - Relaxing the scalene muscles and strengthening muscles of posture
  - Enhance functional limb mobility
  - Diminish repetitive strain exposure in workplace
  - 30% experience improvement in 6 weeks

- Medications:
  - NSAIDS, muscle relaxants, neuropathic pain meds, narcotics on a short-term basis, antidepressants, topical agents (casaicin ointment or lidocaine patches)

- Surgical Treatment—substantial disability in NTOS patients:
  - Supraclavicular
  - Transaxillary
Surgical Decompression

- Supraclavicular exploration
- Anterior and middle radical scalenectomy
- First rib resection
- Brachial plexus neurolysis
- Venolysis

Vascular reconstruction using autogenous conduit:
- GSV Patch Angioplasty
- SCV Bypass with GSV
Complications of Surgical Decompression

- Nerve injury
- Vessel injury
- Pneumothorax
- Lymph fluid leak - chest tube and low-fat diet
- Pleural effusion
- Incomplete decompression - recurrent symptoms
- Should never be stented
Post-operative Management

- Chest tube insertion following decompression - removed when output < 200 in 24 hours (POD3-5)
- Monitor surgical site for swelling, erythema
- Neurovascular checks q 4 hours post-op day 1
- Incentive spirometry Q1 hour
- Early ambulation
- Pain Management:
  - Narcotic pain medication, NSAIDs, muscle relaxants, neuropathic pain medications
- Anticoagulation - VTOS and ATOS (if thrombus present)
- Physical therapy consult for ROM
Following Hospital Discharge

- Physical therapy if needed
- Post-op exercises: scar massage, stretching exercises
- Exercises to improve posture
- Passive movements post-op, active motion to begin 2 weeks post-op
- Limit heavy lifting to affected extremity
Physical Therapy

Stretching of the back of the neck
Physical Therapy

Stretching of the back of the chest
Following Hospital Discharge (cont.)

- Pain management - narcotics, NSAIDS, muscle relaxants, anticonvulsants
- Depression management - antidepressants
- Venogram at 3 month interval - s/p VTOS decompression
- Anticoagulation (ATOS with thrombus present and VTOS) with warfarin, apixaban, or rivaroxaban – 3 to 6 months post-op