Controversies in the Treatment of Thoracic Outlet Syndrome

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Subclavian - Axillary Artery Aneurysms

- Post-stenotic dilatation from cervical rib
- First case of upper extremity ischemia due to a cervical rib by Hodgson in 1915
- Mayo in 1813 described a subclavian aneurysm 2° to a first rib exostosis
- Cooke 1861 removed a cervical rib that was compressing the subclavian artery
Subclavian - Axillary Artery Aneurysms

• In 1916, Halsted reported 27 cases of cervical ribs that had associated subclavian artery aneurysms
• In 1934, Lewis and Pickering described upper extremity thromboembolic complications
• In 1956, Schein described the first case of arterial reconstruction for treatment of thromboembolic complications from a cervical rib with a homograft in the subclavian artery
Subclavian - Axillary Artery Aneurysms

Presenting Symptoms

- Acute or chronic ischemia
- Raynaud’s phenomenon
- Neurologic symptoms
Subclavian - Axillary Artery Aneurysm

Treatment:

• Resection of subclavian artery aneurysm with interposition graft (vein or prosthetic graft)
• Supraclavicular and infraclavicular incisions
• Removal of cervical rib and/or first rib (if synostosis occurs)
• Sympathectomy(?)
Effort Thrombosis

Pathophysiology

• Mechanical abnormality at the costoclavicular portion of the axillosubclavian vein

• Most often acute thrombosis is in an area of chronic compression and stricture - between the hypertrophied scalene or subclavius tendon and the first rib

• A large exostosis is often found at the costoclavicular junction
Effort Thrombosis

• Also known as Paget-Schroetter syndrome

• Commonly treated with lytic therapy followed by immediate or delayed first rib resection and scalenectomy

• In our practice, patients are presenting weeks to months following the acute event with stenosis, occlusion and intermittent compression of the subclavian vein (Mc Cleery’s Syndrome)
Objective

To determine the outcomes in patients presenting with effort thrombosis who have undergone tailored treatment algorithms depending on presentation
Demographics

- Average age 30 (16-52)
- 32 Male and 29 Female
- Presented average 8.6 months (1-312 weeks) following thrombosis or swelling
Previous Treatment

• 23/61 (37.7%) Thrombolysis

• 17/61 (27.9%) Balloon angioplasty
Treatment # 1: Acute Occlusion

- Three patients presented with acute occlusion of the subclavian vein (2, 3 and 7 days)
- All were lysed, underwent first rib resection and scalenectomy followed by 2 week postoperative venogram and venoplasty
- One rethrombosed and was lysed
- Postoperative anticoagulation was given to all patients
- All have patent subclavian veins and are asymptomatic
Treatment # 1: Acute Occlusion
Treatment # 2: Subclavian Vein Stenosis

- Presented 27 weeks on average following acute event
- Comprised of 36 patients who presented with subclavian vein stenosis
- All underwent first rib resection and scalenectomy followed by 2 week postoperative venogram
Treatment # 2: Subclavian Vein Stenosis

- Postoperative venograms:
  - 22 had tight stenosis and underwent venoplasty
  - 13 were non-stenotic and required no further intervention
  - 1 presented with an occluded subclavian vein and was treated with tPA and venoplasty

- Overall, 23 patients underwent venoplasty and were maintained on lifelong anticoagulation
Treatment # 2: Subclavian Vein Stenosis

- 2 patients who underwent postoperative venoplasty thrombosed their subclavian vein, at 1 week and 5 weeks respectively.
  - The first was treated with tPA, redilatation and anticoagulation
  - The second was non-compliant in taking her coumadin and was placed back on anticoagulation
Treatment # 2: Subclavian Vein Stenosis
Treatment # 3: Intermittent Venous Obstruction

- Ten patients who presented on average 57 weeks after their initial event
- All presented with swelling but no thrombosis
- All underwent first rib resection and scalenectomy
- Postoperative venograms in two patients for persistent symptoms
  - One required venoplasty and the other did not
- All are currently asymptomatic
Treatment # 3: Intermittent Venous Obstruction
Treatment # 4: Chronically Occluded Subclavian Veins

- Twelve patients who presented on average 54 weeks since their initial thrombosis
- All underwent first rib resection and scalenectomy followed by venograms in 10 patients
- Duplex scan was utilized in the follow-up period to assess subclavian vein patency
- Attention was given to obtain a transverse view of the subclavian vein, to ensure that the vessel studied was not a collateral
Treatment # 4: Chronically Occluded Subclavian Veins

- 7 so far have recanalized at 6 (2-12) months
- 3 are still on anticoagulation
- 1 did not recanalize who had previous thrombosis years before
- 1 was lost to follow-up
- Only 1 patient was diagnosed with a hypercoaguable state (PAI-1/ Factor V)
Treatment # 4 Chronically Occluded Subclavian Veins
Complications/Outcomes

• No vascular injury
• No brachial plexus or long thoracic nerve injury
• 9/61 (15%) pneumothorax
• 56/61 (92%) patients have patent subclavian veins and all are asymptomatic
Conclusions

At Johns Hopkins, patients with effort thrombosis frequently present late following attempts at intervention elsewhere.
Conclusions

There is a need for tailored treatment including rib resection in symptomatic patients, postoperative venograms with or without intervention, and the use of anticoagulation in chronically occluded veins in this complicated group of young patients to achieve optimal results.
3 MYTHS CONCERNING NEUROGENIC THORACIC OUTLET SYNDROME

1. It cannot be accurately diagnosed.
2. Surgery is the only treatment that works.
3. No one gets better.
MYTH ONE

IT CANNOT BE ACCURATELY DIAGNOSED
Neurogenic Thoracic Outlet Syndrome

- 1st cervical rib removed in 1861 by Holmes Coote in London
- Cervical ribs are present in 10-30% of patients
- Scalene muscle implicated by Naffziger in 1938
- Initially, just scalene muscle was divided but recurrences were high
Neurogenic Thoracic Outlet Syndrome

Diagnosis - History

- Age 20-45 years; majority women
- Repetitive motion occupation or hobbies cause symptoms in 50%
- Trauma initiates symptoms in other 50%
- Initial history and physical takes an hour
THORACIC OUTLET SYNDROME

HISTORY - NEUROGENIC

- Incur symptoms in overhead position (abduction and external rotation)
- Numbness fourth and fifth fingers and ulnar aspect of forearm
- Decreased strength and endurance with exercise (computers)
- Loss of fine motor movements of hand – dropping things
Neurogenic Thoracic Outlet Syndrome

Diagnosis - Physical Examination

- R/O cervical spine disease (30%)
- Pain over scalene muscle/Erb’s point
- Adson’s Maneuver - listen for subclavian bruit
- Elevated arm stress test
- Ulnar weakness > Median and Radial weakness
THORACIC OUTLET SYNDROME

PHYSICAL - NEUROGENIC

• EAST test (elevated arm stress test)
• Tenderness over anterior scalene muscle
• Positive Tinel’s sign at brachial plexus
• Adson’s test – plus/minus
• Subclavian bruit
THORACIC OUTLET SYNDROME

Electrophysiologically Guided Anterior Scalene Block

• Confirm the diagnosis

• Predicts outcome of surgery – “dress rehearsal”

• Temporarily relaxes the anterior scalene muscle to relieve symptoms
THORACIC OUTLET SYNDROME

Electrophysiologically Guided Anterior Scalene Block

• 122 patients between 1993-1995
• All anterior scalene muscles identified and blocked
• No complications or inadvertent somatic or sympathetic ganglion blockade
• 93 (72%) had a positive test
THORACIC OUTLET SYNDROME

Electrophysiologically Guided Anterior Scalene Block

- 38 underwent surgical decompression of the thoracic outlet
- 32/38 (84%) had a positive anterior scalene block before surgery
- 15/33 (45%) had an abnormal SSEP
- 12/35 (38%) had an abnormal EMG and NCV
- 30/32 (94%) with a positive anterior muscle scalene block had a good outcome with surgery
MYTH TWO

SURGERY IS THE ONLY TREATMENT THAT WORKS
Neurogenic Thoracic Outlet Syndrome

Use of Botulinum Toxin

• Used for many years in treatment of conditions characterized by excessive tone in head and neck (torticollis, achalasia, and spasmodic dysphonia)

• Mechanism is prolonged neuromuscular blockade which paralyzes the muscle for up to 6 months in some cases

• Risks are diffusion of toxin into surrounding structures
Neurogenic Thoracic Outlet Syndrome

Use of Botulinum Toxin

- 22 patients injected with both
- 14 (64%) had >50% relief for at least one month with botulinum
- Only 4 had >50% relief for at least a month with lidocaine
- Mean duration 88 days (30-180 days)
- 5 patients had 2 or more repeat injections
Neurogenic Thoracic Outlet Syndrome

Medical Therapy

- Physical Therapy - massage, increased range of motion, strengthening of the shoulder girdle, diathermy and muscle relaxation
- Sleep at night on back with arms on side
- Modification and adjustments in lifestyle
- Successful in 60%
Neurogenic Thoracic Outlet Syndrome

Other Treatments

• Yoga
• Aromatherapy - (lavender)
• Biofeedback
• Pain Management Specialist
• Acupuncture
MYTH THREE

NO ONE GETS BETTER
The Operation

• Transaxillary Approach
• Special Retractor
• Fiberoptic Light Retractor
• Complete resection of rib
• Inspect brachial plexus for bands
Neurogenic Thoracic Outlet Syndrome

Patient Education

• Fear of progressive degenerative neurologic disease with anxiety
• Those who continue to have a progressive psychological disability which acts as an impediment to their medical care
• Usually due to pain
• Can aggravate interfamily and professional stresses
Neurogenic Thoracic Outlet Syndrome

Those to Avoid (ie. Too weird)

• Doctor Shoppers (especially nationally)
• Expectations far outweigh reality
• Want a promise “everything will be OK”
• Many personal problems that need to be resolved
• More than one e-mail a week
Whenever the art of medicine is loved,
There also is love of humanity.

-Hippocrates
Thank You