CT Venography and Therapeutic Options for Venous Occlusion in the Chest

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Thoracic Venous Occlusion
- Thoracic Outlet Anatomy and Pathology
- Obstruction secondary to intravenous devices
- SVC Syndrome
- Some Pitfalls and Artifacts of CT

Thoracic Outlet Syndrome
- Symptoms
  - 95% have neurological symptoms (C8 and T1)
  - 4% have venous symptoms
  - 1% have arterial symptoms
- Paget-Schroetter is one of many sequelae

Paget-Schroetter Syndrome

Normal Anatomy

Thoracic Outlet Syndrome
Hypertrophied scalene muscles compress the vessels and nerves against the clavicle

Front View
Nerves and vessels compressed between the clavicle and first rib


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Paget-Schroetter Etiology

- Repetitive or strenuous activity
  - Venous compression and injury
  - Thrombosis
- Underlying extrinsic compressive anomalies
  - Compression by 1st or cervical rib
  - Hypertrophied anterior scalene muscle
  - Hypertrophied subclavius muscle

• Presentation
  - Young, healthy individuals
  - Often within 24 hours of a strenuous activity
  - Aching in shoulder or axilla; worse with activity
  - Swelling of the arm and hand

• Physical Exam
  - Non-pitting edema
  - Cyanosis of hand and fingers
  - Typically pulses are palpable

Swelling of the left upper extremity due to left subclavian vein thrombosis.

Typical Venogram in patient with Paget-Schroetter Syndrome

22yo female tennis player with arm pain and swelling after strenuous exercise.
Typical Treatment Algorithm

- Thrombolysis
- Surgical decompression of vein
  - 1st rib resection
  - Scaleneectomy
- 2ndary venous treatment if necessary
  - Surgical Venoplasty
  - Angioplasty with Stenting

Completion of Thrombolysis

Residual venous extrinsic compression of vein at the clavicle
Small residual cephalic vein thrombosis

Intravascular Devices

- Venous Catheters
  - Non-tunneled CVC’s
  - PICC Lines(7% incidence!)
  - Tunneled catheters (HD, Hickman)
  - Ports
- Pacemaker leads

Stenosis

L Brachiocephalic Venous Thrombosis due to Mediport

Residual venous extrinsic compression of vein at the clavicle
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Superior Vena Cava Syndrome (SVCS)

1st Described by William Hunter in 1757

Hunter autopsied a man with an aortic aneurysm and found that the SVC and left brachiocephalic vein were "so much compressed by the dilated artery as hardly to have anything left of their natural capacity and appearance."

Hunter W. History of aneurysm of the aorta with some remarks on aneurysms in general. Medical Observations and Inquiries 1:323, 1757

SVCS: A Clinical Diagnosis

Triad:
• facial plethora
• venous distention
• isolated upper hemi-body edema

Clinical manifestation of partial or total obstruction of the superior vena cava.

SVCS may present without acute symptoms.
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It's even possible that some people have SVC and continue their daily activities.

However, for most patients, SVCS is a terrifying condition that bodes ill.

**SVCS Today**

- Over 90% are secondary to malignancy.
- 80% Bronchogenic carcinoma (esp. R side)
- Most other cases Non-Hodgkin’s Lymphoma
- But Intravenous catheters and pacemakers are rapidly becoming an important cause of SVCS

**Malignant Mediastinal Lymphadenopathy**

Some SVCS cases are due to benign mediastinal disease.

**Direct CTV after PTA and Stent**
Central Venous Devices
- Mediports, Hickmans, other
- Chronic Dialysis Catheters
- Pacemaker Leads

Collateral Pathways

Some take weird pathways to get to the Azygos

Hepatic Capsular Collaterals

…to thoracic veins, then Azygos

Chest to Abdomen Collaterals

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Side-to-Side Collaterals


Pitfalls of CT Venography

Poor flow into pre-occluded segment

Dilutional Effects

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Artifacts of CT Venography

Conclusion

- Central vein obstruction in the chest
- Thoracic Outlet S.
- Implanted devices
- SVC Syndrome

- CT Venography helps with
  - Diagnosis
  - Anatomy for treatment

- CTV pitfalls and artifacts