

Venous Thoracic Outlet Syndrome in a Healthy 16-Year-Old

Patient: A Case Report

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Introduction

- Thoracic outlet syndrome (TOS) is a rare condition caused by compression of nerves or blood vessels in the thoracic outlet.¹
- There are three types of TOS:
 - oNeurogenic TOS (nTOS): Most common (95%), caused by brachial plexus compression.
 - oVenous TOS (vTOS): 3-5% of cases, caused by subclavian vein compression at costoclavicular junction.
 - oArterial TOS (aTOS): 1-2% of cases, caused by subclavian artery compression.²
- vTOS, also known as Paget-Schroetter syndrome or effort thrombosis occurs in 1-2 cases per 100,000 people annually.
- TOS is most common between the ages of 25 and 40, with males being 2 times more affected.³
- Venous and arterial TOS are more common in adolescents.
- Sports, especially those with upper arm movements, such as baseball and swimming, increase TOS risk.¹
- TOS presents with pain, tingling, weakness, swelling, or discoloration based on etiology.³
- A physical exam of the upper extremity along with imaging is required to make the diagnosis of TOS. Contrast venography is the gold standard for diagnosis of vTOS.⁴

Thoracic Outlet

- The thoracic outlet is bordered by⁵:
 - Anteriorly: Clavicle
 - Posteriorly: 1st Thoracic Vertebra
 - Medially: Sternum
 - Laterally: 1st rib
- Major structures that pass through the thoracic outlet⁵:
 - Subclavian Artery
 - Subclavian Vein
 - Brachial Plexus

Case Description

- 16-year-old male presented to the ED with sudden swelling, pain, and blue discoloration of his right upper extremity (RUE), which developed within an hour while watching TV.
- Patient denies any recent trauma to the upper extremity.
- Patient denies any recent physical activity. Patient plays basketball but denies playing recently, presently on off-season
- Patient right hand dominant
- Past Medical History: Healthy
- Past Surgical History: None
- Medications: None
- Allergies: None
- Social History: Denies drug use, alcohol use, smoking

Differential Diagnosis	Physical	Diagnostic Results
<ul style="list-style-type: none">- Brachial Plexus Injury- Deep Vein Thrombosis- Cervical Radiculopathy- Rotator Cuff Pathology- Pancoast Tumor	<ul style="list-style-type: none">- General: A&Ox3. Calm and cooperative. No obvious distress.- Pulmonary: Normal pulmonary effort. No respiratory distress. Normal breath sounds- Cardio: S1/S2 appreciated. No clicks, gallops, murmurs. Normal rate and rhythm.- Extremities: Blue, tender, edematous RUE. No edema, erythema, tenderness of LUE	<ul style="list-style-type: none">- RUE Venous US : Acute DVT to right proximal subclavian vein extending to proximal brachial vein.- Arterial US Duplex of RUE: No evidence of hemodynamically significant stenosis. Patent arteries from Doppler imaging of RUE- CTA of RUE: Within confines of technically limited study. No acute vascular abnormality within the right upper extremity

Surgical Course

- The patient was taken into the operating room for mechanical thrombectomy
- Both acute and chronic thrombus removed via percutaneous mechanical thrombectomy
- Repeat venogram was obtained that showed no anterograde flow through the occluded area, but significant stenosis with an abducted arm. Balloon angioplasty was performed.
- No flow detected through stenosis with arm abducted; flow was patent with arm down: TOS confirmed
- Surgeon assessed flow as adequate although there was some residual narrowing left in the thoracic outlet section of the subclavian vein.
- Patient was started on Xarelto after the procedure.
- External compression scheduled for a later date via a partial 1st rib excision.

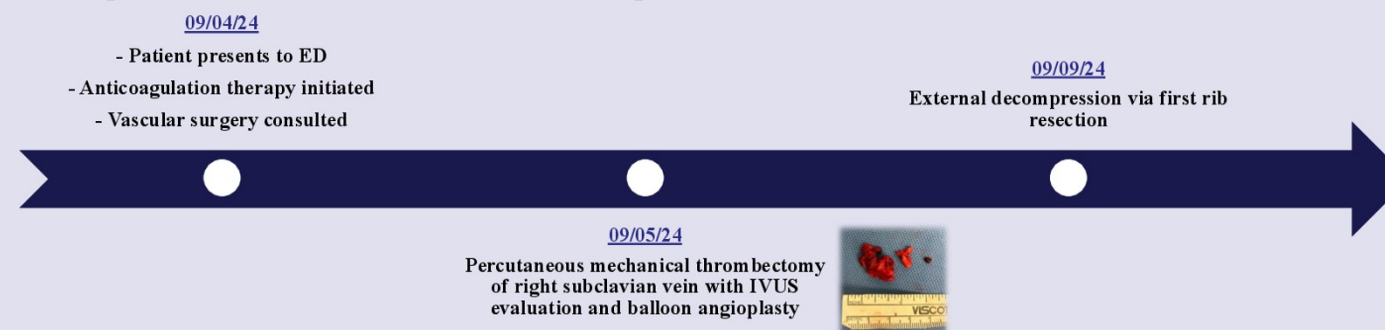


Fig. 1 Timeline of Hospital and Surgical Course for the patient.

Discussion

- TOS management may involve lifestyle changes, physical therapy, pain relief, anticoagulation, and surgery.⁶
- Although surgical decompression is the current standard of care for TOS, the recommendations and treatment protocols for Paget- Schroetter syndrome are controversial.⁷
- Patients with nTOS can be offered a trial of conservative measures for 4-6 months before surgical intervention, however those with aTOS and vTOS typically are recommended to get surgical decompression upon diagnosis, as they are often resistant to conservative treatments and thrombolytic therapies.⁶
- A systemic review from 2021 demonstrated that patients treated with thrombolysis and anticoagulation alone had venous patency and symptom resolution rates of 55% and 63%, respectively, whereas those treated with a first rib resection with or without angioplasty increased these rates to 88-98% for venous patency and 93-95% for symptom resolution.⁷
- The goal of surgical management is to relieve the compression, eliminate the need for long-term anticoagulation and enable unrestricted arm activity.²

Conclusion

- Paget-Schroetter Syndrome, a rare form of venous thoracic outlet syndrome (TOS), requires a high level of clinical suspicion for diagnosis, especially in younger adults. Early recognition and surgical intervention can prevent long-term complications and lead to complete symptom resolution. This condition differs from other deep vein thromboses due to its unique pathophysiology, clinical manifestations, and functional implications.

References

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