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Oddities of Medical School: A Case Report of Upper Extremity Deep Vein Thrombosis (Paget-Schroetter Syndrome) in a 27-Year-Old Female

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ABSTRACT

Upper Extremity Deep Venous Thrombosis (UEDVT) occurs rarely and only accounts for 4 to 10% of all deep vein thrombosis cases. Due to this rarity, UEDVTs can often mimic other diseases and are frequently misdiagnosed at initial presentation. Immediate identification and treatment is warranted for this disease since some UEDVTs can progress to pulmonary embolism. Likewise, delayed identification can also result in post-thrombotic syndrome of the arm. This case report recounts the presentation of a 27-year-old medical student who presented to an outpatient family medicine office with swelling and pain of the right upper extremity. She would later be diagnosed with UEDVT and consequently thoracic outlet syndrome. Key aspects of the case will be presented in relation to the identification, diagnostic workup, and treatment of the aforementioned patient. Unlike lower extremity deep vein thrombosis, clear algorithms for identification and management of UEDVTs are fewer and far between. This again often results in treatment confusion and delay in identification. With this in mind, it is the goal of this article to review the anatomy, risk factors, and epidemiology related to patients with UEDVTs. Furthermore, recommendations concerning the diagnostic identification of these patients will be discussed. Acute treatment modalities for alleviation of symptoms and prevention of progression to pulmonary embolism will also be examined. Last, information concerning reoccurrence prevention and lifetime symptom relief will be assessed.

INTRODUCTION

Upper Extremity Deep Venous Thrombosis (UEDVT) is extremely rare. This disorder accounts for approximately 4 to 10% of all DVTs with an estimated annual incidence of 3.6 per 100,000[1]. There is a clear and defined identification and management strategy in dealing with deep vein thrombosis in the lower extremity [2]. However, this is not the case for UEDVT. With this rarity, UEDVTs often go misdiagnosed at initial clinical presentation and treatment can often be delayed. This delay can result in progression to a more serious situation. Untreated UEDVT can result in a pulmonary embolism. Furthermore, UEDVT can result in chronic conditions such as thoracic outlet syndrome and post-thrombotic syndrome.

UEDVT can occur from many different sources and can either be primary or secondary in nature. Primary "spontaneous" UEDVT, is also termed Paget-Schroetter syndrome, or "effort" thrombosis. This usually results from an anatomic abnormality of the thoracic outlet causing axillosubclavian compression and subsequent thrombosis [3]. Secondary UEDVTs can be provoked by transient or persistent risk factors [4].

This case report recounts the presentation of a 27-year-old female who presents with swelling and pain of the right upper extremity. Initial work-up of the patient was negative for the cause of her symptoms and with additional testing she was found later found to have a UEDVT and subsequently thoracic outlet syndrome. Therefore, the value of this case report is to highlight the presentation and timely identification of this rare disease and provide insight into multiple treatment options to prevent future complications.

CASE

A 27-year-old female medical student presented at an outpatient family medicine office with pain and swelling of the right upper extremity. She states that she was working in the emergency room on a clinical rotation and began to have intermittent right shoulder pain. She stated that later that evening she began to have swelling in the right arm from the shoulder to her fingertips. She stated that with this swelling her veins became more visible and her arm had a more dusky appearance. She described the pain as throbbing and at times she felt that her arm was "going to explode." She denied any previous history of similar episodes. She stated that she did get some relief by elevating her arm above her head, but this was only temporary. Due to the swelling and pain she did admit to some arm weakness and neck stiffness. She denied any shortness of breath, chest pain, pleuritic pain, or other areas of swelling. She denied any recent travel.

The patient's past medical history is pertinent for previous shoulder dislocations bilaterally as well as a previously dislocated elbow related to sports injuries. These injuries were not recent. She had no significant family history in relation to any clotting disorders. She did not smoke and reported drinking alcohol socially. Her only medication was oral birth contraception.

On physical examination, the patient had a BMI of 24, blood pressure was 120/80, heart rate was 70, respiratory rate was 18, and temperature was 98.3°F. Edema was present from the right shoulder to the fingertips. The patient had varicosities over the right chest region and some swelling above the clavicle and sternal notch. This improved momentarily with lifting the arm above the head. Range of motion testing produced mildly reduced range of motion of the right arm, but normal range of motion of the neck. Both radial and ulnar pulses were +2/4 bilaterally. The remainder of the physical examination was unremarkable.

At this point, a determination was made for the patient to have more extensive workup to be performed through the emergency department. Upon arriving the patient underwent unremarkable blood testing including a complete blood count with differential and a basic metabolic panel. Urine pregnancy testing was negative. In the emergency department the patient underwent both Computed Tomography (CT) of the Neck and Chest with contrast that were both found to be unremarkable for any abnormalities. At this point the patient was deemed stable and discharged with follow-up with primary care physician and rheumatology.

The patient returned to the primary care physician's office the following day with slight improvement of the symptoms but continued swelling and pain. The patient was then sent back to the hospital for vascular surgery consultation and Doppler ultrasound of the right upper extremity. Ultrasonography revealed occlusive deep vein thrombosis in the subclavian, axillary and basilic veins, with nonocclusive thrombosis in the brachial veins.

With this clinical presentation the patient was admitted to the hospital and was initially treated with IV Heparin for anticoagulation. The patient underwent contrast venography and then received both mechanical and tissue plasminogen activator thrombolysis, which did achieve patency. The patient was discharged on warfarin and low molecular weight unfractionated heparin until an INR goal of 2 to 3 was achieved. The patient remained on oral anticoagulation and transferred to another vascular surgeon when she ultimately underwent thoracic outlet decompression. Following negative d-dimer and ultrasonography months after the surgery her anticoagulation was stopped and she remained symptom free.

DISCUSSION

Anatomy

The upper extremity veins are divided into two main subgroups: superficial and deep veins. The superficial veins of the upper extremity consist of the cephalic, basilica, median cubital, and accessory cephalic veins. Occlusions of these veins do not normally result in pulmonary emboli. The deep veins of the upper extremity consist of the paired ulnar, radial, and interosseous veins in the forearm. Other deep veins of the upper extremity include the paired brachial and axillary vein. The axillary vein itself becomes the subclavian vein at the lower border of the teres major muscle[24].

The thoracic outlet also plays a major role in the anatomy of the upper arm. The thoracic outlet is bounded by the spinal column, first rib, and the scalene muscles. Occlusion or compression of the thoracic outlet usually involves the scalene musculature or the area between the first rib and the clavicle[24].

Epidemiology & Risk Factors

As stated before, UEDVT represents only a small portion of DVTs and can be further characterized into Primary UEDVT and Secondary UEDVT. Primary UEDVTs occur idopathically or as in Paget-Schroetter syndrome, can occur due to repetitive strenuous motions that cause compression of the subclavian vein. These primary UEDVTs account for approximately 20% to 50% of all UEDVTs [1,4-9].

Secondary UEDVTs occur secondary to a transient or chronic stimulus. Risk factors for UEDVTs include the presence of a central venous catheter, cancer and surgery of the upper extremity [4]. Weaker risk factors for UEDVT are family history of venous thromboembolism, immobilization, oral contraceptives, thrombophilia, pacemakers, and anatomic abnormalities of the thoracic outlet [4,7,10-13].

Differential Diagnosis

UEDVT diagnosis can often be confusing and can be present similar to a variety of other disease processes. However, with proper questioning and examination other associated symptoms and presentation can help differentiate between UEDVT and other conditions *(Table 1, page 3)*.

TABLE 1:

DIAGNOSIS	ASSOCIATED SYMPTOMS/PRESENTATION
Paget-Schroetter Syndrome	The patient is usually otherwise healthy and young. No history of venous insult (trauma or catheterization) with sudden onset of pain and swelling usually following a repetitive, strenuous exercise such as using a racket or clubs.
Thoracic Outlet Syndrome (TOS)	Can occur due to venous occlusion with or without thrombus (Paget-Schroetter Disease), arterial obstruction, or neurogenic causes. Arterial obstruction usually results in a color change of the arm and can have a mild ache especially with overhead exercises. Neurogenic causes involve compression of the brachial plexus. These patients will have a painless atrophy of the hand causing a decrease in grip strength. Neurogenic TOS can also involve loss of sensation and paresthesias.
Heart Failure	Patients usually have bilateral swelling and known cardiopulmonary history. Swelling is also usually not only confined to an upper extremity.
Cellulitis	Pain, swelling, redness can occur. Systemic symptoms and fever may also be present. Possible signs of bacterial infiltration may or may not be present.
Lymphedema	Not usually acute in onset. Some form of surgical maneuver has previously occurred such as a lymph node biopsy.
Malignancy	B-symptoms may or may not occur. These may include fever, chills, night sweats, weight loss.

Paget-Schroetter Syndrome

Paget-Schroetter Syndrome usually occurs in otherwise healthy individuals. The vast majorities of these patients are young and usually participate in some activity that requires frequent and strenuous movement of the upper extremity. The disease process itself is characterized by an abrupt and spontaneous swelling of the entire arm. Cyanosis and pain can also occur and can be increased with positioning. Enlargement of the arm and chest wall superficial venous vasculature is commonly found (Urschel's sign) [14].

It is important to quickly identify and treat Paget-Schroetter Syndrome due to the various complications that can occur from delayed diagnosis. For example, complications of Paget-Schroetter Syndrome include pulmonary embolism, post-thrombotic syndrome, and recurrent thrombosis [14, 15].

Diagnostic Identification of UEDVT

As previously stated, in dealing with patients with a suspected DVT of the lower extremity or pulmonary embolism strict diagnostic protocols and treatment algorithms exist. In dealing with UEDVT, due to its rarity, there is a much lower quantity of studies producing an increase in confusion on how to approach initial workup.

D-Dimer Testing

D-dimer testing may be elevated in patients with UEDVT similar to patients with lower extremity DVT or pulmonary embolism. However, as a sole testing to rule-out a DVT it is not useful. Two studies exist specifically testing for a d-dimer's utility in UEDVT. These studies show a 92-100% sensitivity but only a 14-60% specificity [4,16-17]. Therefore, like other studies examining D-dimers and lower extremity DVTs and PEs D-dimer's have a high-negative predictive value, however it is not specific for an anatomical location of the thrombosis and does not exclude vein compression as a source for symptoms [18].

Ultrasonography vs. Contrast Venography vs. CT vs. Magnetic Resonance Angiography (MRA)

Catheter-directed contrast venography is still considered the gold standard as the most direct and definitive means to confirm the diagnosis of UEDVT [14,19]. However, due to the invasiveness and contraindications due to renal failure, allergic reactions, and pregnancy multiple modalities of ultrasonography are replacing venography in clinical practice as the preferred imaging technique [4,20].

Overall, ultrasonography provides a good discriminatory performance with a high accuracy. In a systematic review of eleven studies that compared various ultrasonography methods against venography, the pooled sensitivity and specificity were 84% and 94%. However, these studies were small and had limiting validity and generalizability of the findings [4]. Similarly there is a false-negative rate associated with ultrasonography that can be technician dependent complicated by acoustic shadows [14]. Therefore, although there is an increased ease and safety associated with ultrasonography making it an initial test of choice it cannot solely be used to deny the presence of the disease.

CT and MRA can also be highly sensitive for UEDVT. However, due to cost as well as lack of studies associated with these modalities they are not currently recommended for UEDVT initial testing [4].

Treatment

It is imperative to treat UEDVT quickly to prevent sequela ranging from pulmonary embolism, post-thrombotic syndrome, to reoccurrence. Initial treatment begins with anticoagulation with low molecular weight unfractionated heparin or a direct thrombin inhibitor. Furthermore, anticoagulation should occur for a minimum of 3 months in accordance American College of Chest Physicians [21]. The goal of this anticoagulation is to maintain the patency of collateral veins, reduce the risk of propagation of the thrombus itself, and aid in the prevention of pulmonary embolism formation. [22,23].

Once initial anticoagulation occurs, a decision must be made concerning direct thrombolysis. Studies show that combining anticoagulation, thrombolysis, and thoracic outlet decompression treatments best improve the long-term outcomes in patients with primary upper extremity deep vein thrombosis [15]. Furthermore, thrombolysis best benefits the young, active, patient with moderate-severe symptoms especially if started on a less than 2 week old thrombosis.

This more aggressive approach culminates with thoracic outlet decompression. Since the thrombus was created due to repetitive occlusion of the thoracic outlet vascular itself, it is intuitive that decompression of these structures would benefit the patient. Likewise, this compression of the venous vasculature can reoccur which increases the patient's risk for recurrent UEDVT. With this in mind, surgical decompression is indicated for a variety of patients, without contraindication, with UEDVT. This surgical approach usually involves first rib resection, scalenectomy, as well as removal of any fibrous bands or other scar tissue [15].

CONCLUSION

UEDVTs can occur due to an idiopathic or exertion primary source or from other secondary sources. Due to their rarity they can often go misdiagnosed at initial presentation, but early detection and treatment remain key to better outcomes and recovery for these patients. By taking an extensive history and physical the physician can use a variety of imaging modalities to confirm his or her diagnosis of UEDVT. Furthermore, once discovered an aggressive approach combining anticoagulation, direct thrombolysis, and surgical decompression appears to provide the best long lasting results for patients impacted by primary unprovoked UEDVT.

CONFLICTS OF INTEREST

The author has no conflicts of interest to declare.

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