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THROMBOSIS OF INFERIOR VENA CAVA DIAGNOSED USING POINT-OF-CARE ULTRASOUND AFTER PEDIATRIC NEAR-SYNCOPE

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Abstract—Background: Venous thromboembolism (VTE) is extremely rare but under recognized in the pediatric population. Although the literature on the use of ultrasound to detect VTEs in adults is plentiful, little has been documented on its use in the pediatric population. **Case Report:** We present a case of a healthy 16-year-old female who presented to our emergency department with 3 months of dyspnea on exertion and one episode of near-syncope. Point-of-care cardiac ultrasound identified an inferior vena cava thrombosis. Subsequent computed tomography angiography diagnosed concurrent bilateral pulmonary emboli (PE). The patient's identical twin sister presented with similar symptoms shortly thereafter and was also diagnosed with VTE and bilateral PE. **Why Should an Emergency Physician Be Aware of This?:** This case demonstrates an instance of VTE and pulmonary embolism in twin adolescent girls. Physical examination findings, electrocardiogram, chest x-ray study, and several previous evaluations did not reveal the diagnosis. Point of care ultrasound was used to correctly diagnosis VTE and for heightened concern for a pulmonary embolism. © 2016 Elsevier Inc. All rights reserved.

Keywords—venous thromboembolism; pediatric ultrasound; pulmonary embolism

INTRODUCTION

Venous thromboembolism (VTE) is extremely rare and under recognized in the pediatric population, with an incidence of 0.9 to 4.6 per 100,000 children per year (1). This disorder is often seen in adults and commonly manifests as either deep venous thrombosis (DVT) or pulmonary embolism (PE), or both (2). We present the case of a healthy 16-year-old female who presented to the emergency department (ED) after several months of exertional dyspnea and syncope. Evaluation in our ED consisted of a point-of-care ultrasound (POCUS), which was able to visualize a thrombus in the inferior vena cava (IVC). These findings prompted further imaging, which also revealed extensive PE.

CASE PRESENTATION

A 16-year-old previously healthy Caucasian female presented to the ED with a chief complaint of shortness of breath upon exertion for 3 months. The patient had been seen by multiple clinicians, including a pediatric pulmonologist. After treatments for musculoskeletal pain, reactive airway disease, and possible occult

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pneumonia, there was no improvement in her symptoms. Later, she began experiencing right-sided chest pain and flank pain. On the day of presentation to the ED, the patient took part in a soccer match and experienced an episode of severe dyspnea and near syncope. On the soccer field, she was noted to be diaphoretic and in respiratory distress. She was brought by private vehicle to the ED for evaluation.

In the ED, her vital signs were: temperature of 97.9°F, blood pressure 111/62 mm Hg, pulse rate 85 beats/min, respiratory rate 16 breaths/min, and oxygen saturation of 98% on room air. The patient had no significant medical or surgical history. She had no known allergies. Her only medication was an oral contraceptive pill (OCP), norgestimate/ethinyl estradiol, which she had been using for the past 5 months as treatment for acne. The patient had no family history of cardiopulmonary disease, bleeding disorders, or hypercoagulable disorders. She denied tobacco, alcohol, or illicit drug use. On further physical examination, she was alert and oriented, and in no apparent distress. Her heart sounds were normal without murmur, bruit, or rubs. Breath sounds were equal bilaterally without crackles, wheezes, or rhonchi. Bilateral lower extremities were equal and symmetric without edema.

Initial ED workup consisted of a chest x-ray study and electrocardiogram, which were unremarkable. A POCUS by the treating clinician was done to assess cardiac function and volume status. Cardiac function appeared normal without evidence of pericardial effusion or right heart strain. While assessing the IVC for volume depletion, a large nonocclusive thrombus was identified (Figure 1). This prompted further imaging, which included a computed tomography (CT) scan of the abdomen/pelvis with venogram and CT angiography of the chest. These imaging tests confirmed that the patient had extensive

venous thrombus involving the IVC extending to the renal artery, bilateral common iliac veins, left internal iliac vein, bilateral external iliac veins, and left gonadal veins. Chest CT angiography revealed extensive bilateral acute PEs with corresponding areas of pulmonary infarction. Patient was admitted for anticoagulation and hypercoagulability studies.

One day after the patient was discharged, her identical twin sister presented to the ED with a similar presentation, including exertional dyspnea, near-syncope, and flank pain. She was also diagnosed with multiple bilateral PEs and a thrombus in the left common iliac vein extending into the left internal iliac vein. To date, all testing has been negative and, in both instances, the thrombi have been attributed to OCP use. Repeat ultrasound has shown resolution of the IVC VTEs, and both patients have been asymptomatic since anticoagulation was started.

DISCUSSION

VTE is often seen in adults and commonly manifests as either DVT or PE, or both (2). In the pediatric population, VTE is extremely rare and under recognized, with an incidence of 0.9 to 4.6 per 100,000 children per year (1). In adults, ED workup is often pursued in patients with pleuritic chest pain, exertional dyspnea, or significant risk factors. Several scoring systems including the Pulmonary Embolism Rule-out Criteria score and Wells criteria have been validated and are often used to identify high-risk patients (3,4). However, VTE continues to be under diagnosed due to the low level of suspicion in healthy children and adolescents (5).

In our case, despite an extensive prior workup, our patient's disease process remained undiagnosed. We suspect this stems from the fact that most cases of VTE in children are seen in tertiary care facilities and are typically iatrogenic (6). In addition, the majority (63%) of children diagnosed with VTE had at least one coexisting chronic complex medical condition, which may have lowered the pre-test probability for the clinicians who had previously evaluated our patient (7). And although echocardiography did not show significant signs of heart strain to suggest PE, visualization of clot in the IVC significantly increased the pre-test probability and concern for PE, which ultimately led to the diagnosis. In this specific case, the IVC was assessed to determine whether volume depletion played a role in the patient's symptoms when the clot was incidentally noted. It is believed that, due to the duration of symptoms, the patient may have developed physiologic compensation, which resulted in normal triage vital signs. Given the outcome of this case, we suggest that POCUS may be considered to aid in the evaluation of pediatric patients with exertional respiratory complaint.

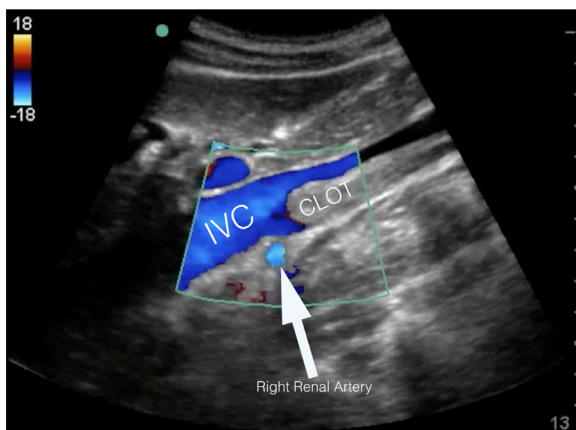


Figure 1. Subcostal view of the inferior vena cava (IVC) with clot noted.

After diagnosis, both patients were admitted for anti-coagulation. Inpatient testing included common genetic risk factors, such as factor V, protein C, and protein S, which increase patient risk for DVT/PE (8). To date, all tests have been negative, however, we continue to suspect a genetic predisposition to their hypercoagulable state. One month after discharge, both patients underwent repeat ultrasound, which showed complete resolution of the IVC VTE.

WHY SHOULD AN EMERGENCY PHYSICIAN BE AWARE OF THIS?

Although VTE is often evaluated in the ED, it is rarely considered in pediatric patients due to a low level of suspicion. Adults with concern for VTE can be evaluated using clinical decision making rules or CT scans. Unfortunately, no comparable scoring criteria exist for pediatric patients and CT scans are often avoided due to ionizing radiation. In our case, VTE was incidentally noted on POCUS. Given the duration of symptoms without a diagnosis, practitioners should maintain a high level of suspicion for VTE in patients with exertional dyspnea, near-syncope, and OCP use. Clinicians should consider POCUS or advanced imaging in patients with a high pretest probability.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.jemermed.2016.06.008>.

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