

EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE



Care Warriors

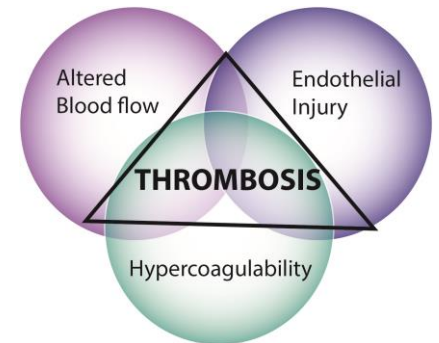
Author: Joel John, MS IV | Editor: Samir Hussain, M.D.

September 2018 | Vol 5 | Issue 13

Pulmonary Embolism

A 50-year-old male presents to the ED complaining of a sudden onset of dyspnea and chest pain that is worsened when taking deep breaths. He denies fever, nausea, vomiting, or hemoptysis. His medical history is significant only for an inguinal hernia repair two weeks ago. The hospitalization stay was extended due to a wound infection. He is only taking ibuprofen for pain. On physical examination the patient is tachypneic with a respiratory rate of 26 bpm, a pulse of 120bpm, blood pressure of 110/70, and O2 saturation of 88%. There is jugular venous distension, moderate left calf swelling, and lungs are clear to auscultation bilaterally. The wound site is clean and the rest of the exam is within normal limits. Supplemental oxygen is provided and saturations are now 90 percent. Which of the following is the most appropriate next step in management of this patient?

- A. Fluid resuscitation
- B. Venous Doppler Ultrasound
- C. Empiric anticoagulation
- D. CT angiography



- Virchow's triad: Risk factors predisposing thrombus formation
- 60% of patients with an untreated proximal lower extremity DVT will progress to PE.
- An acute onset of dyspnea or hypoxemia with an unremarkable chest x-ray is a PE until proven otherwise.

EM Case of the Week is a weekly "pop quiz" for ED staff.

The goal is to educate all ED personnel by sharing common pearls and pitfalls involving the care of ED patients. We intend on providing better patient care through better education for our nurses and staff.

BROWARD HEALTH MEDICAL CENTER

Department of Emergency Medicine
1625 SE 3rd Avenue
Fort Lauderdale, FL 33316

Warriors

The correct answer is C. Empiric Anticoagulation. Given the patient's most recent surgical history and extended hospitalization, there is a high clinical suspicion for PE. He is in the high risk category according to Well's criteria. Patients who are of low risk of bleeding with a predominant risk factor should be empirically treated. Treatment in this case should not be delayed while awaiting the results of diagnostic tests.

Discussion

A pulmonary embolism (PE) is a blood clot that typically originates from proximal lower extremity veins, which embolizes causing a blockage of the pulmonary arteries. The pathogenesis of clot formation can be described by Virchow's triad, including venous stasis, endothelial injury, and a hypercoagulable state. A deep vein thrombosis (DVT) leading to a PE can be further subdivided into a provoked and unprovoked presentation. Provoked DVT's/PE's involve acquired or inheritable causes that confer an increased risk. To name a few, these major risk factors include recent surgery or trauma, an extended period of immobilization, malignancy, pregnancy, hormonal therapy, and any of the inherited thrombophilias such as Factor V Leiden or Protein C or S deficiency. Examples of unprovoked causes include obesity and heavy cigarette smoking.

The clinical presentation of PE is characterized by a sudden onset of dyspnea with observable tachypnea. Patients will often also complain of chest pain that is pleuritic in nature. Other noteworthy signs include cough, hemoptysis, jugular venous distension, an increased pulmonic component and a systolic murmur that increases on inspiration. Signs of DVT include pain, erythema, and swelling of the lower extremity.

In terms of diagnostic workup, the most critical first step is determining the patient's pretest probability. A scoring system such as the Well's criteria (Table 1) helps to classify patients into low, moderate, and high risk categories. Laboratory tests including CBC, ABG, and troponins, and an electrocardiogram (ECG) and chest x-ray (CXR) are nonspecific tools to help look for other attributable causes.

Wells score

Criteria	Points
Clinical signs/symptoms of DVT	3
PE is most likely diagnosis	3
Tachycardia (>100 bpm)	1.5
Immobilization/surgery in previous 4 weeks	1.5
Prior DVT/PE	1.5
Hemoptysis	1
Active malignancy (trt w/in 6 month)	1

Low Risk < 2 points	Intermediate risk 2-6 points	High risk >6 points
-------------------------------	--	-------------------------------

PE unlikely 0-4 points	PE Likely >4 points
----------------------------------	-------------------------------

On an ECG there may be signs of right ventricular strain such as T-wave inversions in Leads V1-V4, a right bundle-branch block, or the uncommon S1-Q3-T3 pattern. However, the most common finding is sinus tachycardia. On CXR, two classic signs not commonly present is the Westermark sign or decreased vascularity on one side, and Hampton's Hump sign which is a peripheral wedge-shaped density. The absence of any of these signs does not exclude a diagnosis of PE. In patients with a low pretest probability, a low d-dimer is most useful in ruling out a diagnosis of PE. For patients with a low to moderate risk but a high D-dimer level or patients with a high probability, the most appropriate diagnostic imaging modality is a CT pulmonary angiogram. V/Q scan should be considered in patients with renal dysfunction or other contraindications to CT.

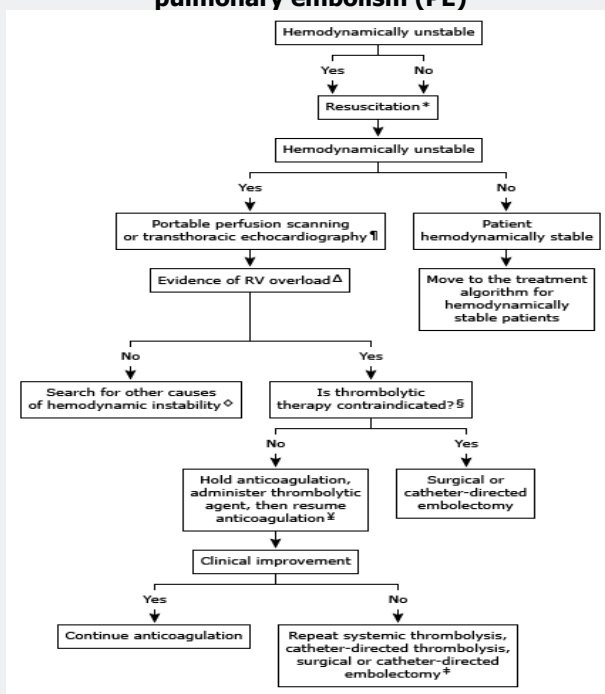
For a list of educational lectures, grand rounds, workshops, and didactics please visit BrowardER.com and **click** on the **"Conference"** link.

All are welcome to attend!

Management:

The first step in management is addressing ABCs. If respiratory support is needed, then oxygen supplementation or mechanical intubation should be started. Hemodynamic stability is what distinguishes a massive from a submassive PE. Management of the hemodynamically stable patient with a potential PE begins with initial assessment and determination of pretest probability with Wells Criteria. If the patient is high risk, anticoagulation should not be delayed. For low to moderate risk patients, empiric anticoagulation may be delayed for diagnostic confirmation, assuming there is no extensive delay in testing. Anticoagulation therapy is typically low-molecular-weight heparin bridged to Coumadin. Patients with contraindications to anticoagulation should be considered for an inferior vena cava filter. A submassive PE patient is symptomatic and has signs of RV strain and should receive heparin drip with a bridge to Coumadin. Massive PE's are a time critical emergency and carry a mortality rate of greater than 15%. These patients present with a systolic pressure of less than 90 mmHg with signs of right ventricular strain. The treatment algorithm for management of a patient with an unstable PE is provided below. These patients should receive immediate fluid resuscitation, assessed for RV strain, and given tPA. If thrombolytic therapy is contraindicated or there is still no sign of clinical improvement following repeated doses of tPA then interventional thrombectomy is warranted.

Treatment algorithm for hemodynamically unstable patients with suspected pulmonary embolism (PE)



Take Home Points

- CT angiogram is the imaging modality of choice for diagnosis of PE. V/Q scan should be considered for patients with contraindications to contrast use.
- The Well's criteria is a valuable scoring system for risk stratification in patients with potential PE.
- Massive PE's are a time critical emergency with a mortality rate of >15%. If there are no contraindications, tPA should be administered immediately.



ABOUT THE AUTHOR

This month's case was written by Joel John. Joel is a 4th year medical student from NSU-COM. He completed his emergency medicine rotation at Broward Health North in September 2018. Joel plans on pursuing a career in Internal Medicine after graduation.

REFERENCES

Thompson, T., & Kabrhel, C. (2018). Overview of acute pulmonary embolism in adults. In UpToDate, Eugene C. Toy; Adam J. Rosh; Barry C. Simon; Katrin Y. Takenaka; Terrence H. Liu. Pulmonary Embolism. In Case Files