EM CASE OF THE WEEK.

BROWARD HEALTH MEDICAL CENTER
DEPARTMENT OF EMERGENCY MEDICINE

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Pulmonary Embolism

A 58-year-old male with no past medical history presents to the ED with shortness of breath for the past week. He has never experienced these symptoms prior to this episode and is an avid biker. He denies chest pain, weakness, or fevers. He denies any surgeries, tobacco use, or hormone use. No recent travel or immobilization. His vitals are as follows: afebrile, heart rate is 116 bmp, BP 115/70 mmHg, RR 20 breaths/min, SpO2 98%. On physical exam, the patient appears comfortable and has no evidence of respiratory distress. He is tachycardic with right lower extremity edema and clear lungs bilaterally upon auscultation. Homan's sign is negative. Well's score is 7.5. Which of the following is the best workup and management of this patient's condition?

A. EKG, basic labs, d-dimer

B. EKG, respiratory support as needed, basic labs, d-dimer, ultrasound

C. EKG, respiratory & hemodynamic support as needed, empiric anticoagulation with LMWH. Basic labs, ultrasound and CTA

D. EKG, basic labs, empiric anticoagulation with LMWH

E. No further testing needing

White arrows depict a large clot with associated filling defect in right pulmonary artery.

Right lower extremity DVT
(www.sciencephoto.com)
Right lower extremity with asymmetric enlargement and warmth. Extremity may be nontender and ulcerated.

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.

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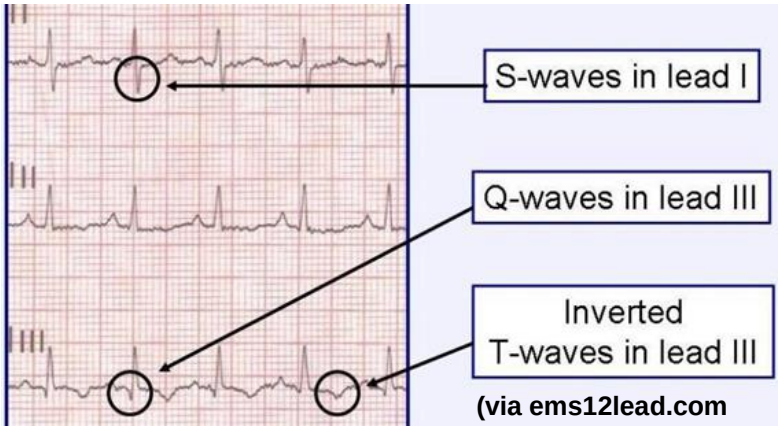
The correct answer is C. Initial therapy includes as needed respiratory and hemodynamic support (ABCs). Empiric anticoagulation can be started in patients with no risk of bleeding while a full workup for PE can be performed. ECG is a helpful diagnostic test as well as ultrasound and CTA if warranted. Basic labs such as compete blood count, arterial blood gas, troponins could help rule out other causes.

Discussion

Acute pulmonary embolism (PE) is a most commonly a venous thromboembolism and refers to obstruction of pulmonary artery or one of its branches by mass (thrombus, tumor, air, fat) that originated elsewhere[1,2]. It can be further described by hemodynamic stability and anatomic location. Those with hemodynamically unstable PE often die within first 2 hours due to obstructive shock[2]. The annual incidence is approximately 112 per 100,000 population. In the US, PE accounts for 100,000 annual deaths. The incidence is higher in those with malignancy, pregnancy, stroke, hospitalized, gynecologic, nephrotic syndrome, acute traumatic spinal cord injury, total joint arthroplasty and inherited thrombotic disorders.

The presentation of PE may be vague, often presenting with acute sudden onset of shortness of breath and chest pain[2]. The diagnosis of PE requires good clinical acumen and systematic approach. Several scoring tools have also been developed to calculate the probability of PE, one of which is the Well's score. Well's score encompasses signs of symptoms of DVT/PE, heart rate, immobilization/surgery, hemoptysis, malignancy or prior history of DVT/PE, provides an objective risk of a new PE. This patient has a high risk of a DVT/PE using the Well's score with 37.5% prevalence of PE, and therefore should undergo further work-up with CTA[2]. Electrocardiogram and imaging can also be helpful in raising suspicion for a PE. In PE, ECG may show T-wave inversions in V1-V4 or right heart strain with S1Q3T3 pattern. Sinus tachycardia or RBBB are however the most common rhythms[2,4].
Chest X-ray can show Hampton's hump which is a peripheral wedge-shaped infarct. CTA is typically done to confirm PE and visualize the thrombus.



Treatment

The mainstay of pharmacologic therapy in pulmonary embolism is immediate full anticoagulation[2]. Initial therapy includes respiratory support to maintain SpO2 ≥90%, hemodynamic support, and empiric anticoagulation. The optimal agent for empiric anticoagulation depends on the presence of hemodynamic instability, anticipated needs for procedures or thrombolysis and presence or risk factors and comorbidities.

Thrombolytic therapy should be used in those that fulfill the following criteria: hypotension (SBP < 90mm Hg) and no high bleeding risk or those without hypotension & low bleeding risk who are at high risk of developing hypotension.

Those with massive pulmonary embolisms and contraindications for fibrinolysis or instability can undergo catheter directed embolectomy. Submassive acute PE patients can also have catheter directed embolectomy if they have an adverse prognosis.

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!

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Wells criteria and modified Wells criteria: Clinical assessment for pulmonary embolism

▪ Clinical symptoms of DVT (leg swelling, pain with palpation)	3.0
▪ Other diagnosis less likely than pulmonary embolism	3.0
▪ Heart rate >100	1.5
▪ Immobilization (≥3 days) or surgery in the previous four weeks	1.5
▪ Previous DVT/PE	1.5
▪ Hemoptysis	1.0
▪ Malignancy	1.0
Probability	**Score**
Traditional clinical probability assessment (Wells criteria)	
High	>6.0
Moderate	2.0 to 6.0
Low	<2.0
Simplified clinical probability assessment (Modified Wells criteria)	
PE likely	>4.0
PE unlikely	≤4.0

DVT: deep vein thrombosis; PE: pulmonary embolism.

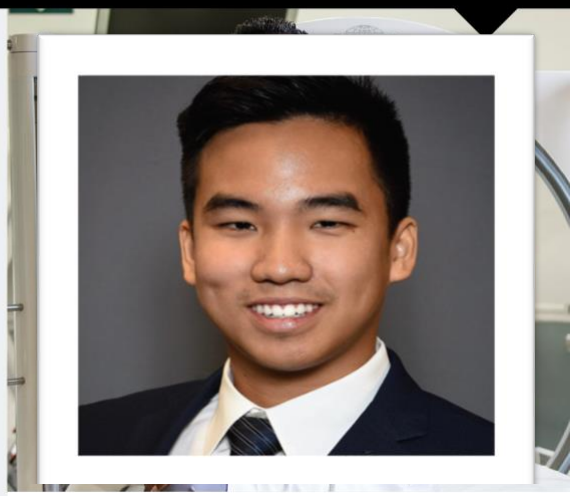
Data from van Belle A, Buller HR, Huisman MV, et al. Effectiveness of managing suspected pulmonary embolism using an algorithm combining clinical probability, D-dimer testing, and computed tomography. JAMA 2006; 295:172.

UpToDate®

Well's Criteria: Moderate (2-6), high (>6) warrants a CTA. If there are clinical signs or PE is most likely that already puts them into the moderate – high risk category. Other use for pre-test probability includes physician gestalt.

Take Home Points

- Pulmonary embolism mainly occurs from a thrombus which originated as a DVT that becomes lodged and blocks blood flow to the lung.
- It is more common than you think, always consider when patient presents with chest pain or shortness of breath especially in high risk populations.
- Diagnosis can be made based on pre-test probability using Well's criteria and risk stratification with moderate and high receiving a CTA.
- Treatment involves anticoagulation (6 months long) but also hemodynamic and respiratory support (ABCs).



ABOUT THE AUTHOR

This month's case was written by Dan Pham. Dan is a 4th year medical student from FIU-COM. He did his emergency medicine rotation at BHMC in October 2020. Dan plans on pursuing a career in Pediatrics after graduation.

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