

MORNING REPORT

WEIGHING THE RISKS: ANTI-COAGULATION CHOICE FOR PULMONARY EMBOLISM IN OBESITY

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A 28-year-old obese woman presented with acute onset of shortness of breath and pleuritic chest tightness. She reported difficulty taking a full breath after walking up a flight of stairs and had difficulty working as a hairdresser.

The differential diagnosis for dyspnea is extensive and multifactorial with physiological, psychological, social, and environmental factors. Causes of dyspnea can be divided into two groups: respiratory dyspnea and cardiovascular dyspnea. Respiratory dyspnea can be caused by disorders of the central controller (chemoreceptors for pH, CO₂, and O₂ in the brain stem, cortical volitional, cortical behavioral), disorders of the ventilator pump (muscles, bones/joints in thorax, airways, peripheral nerves, pleura), and disorders of gas exchange (alveoli, pulmonary circulation). Patients with cardiovascular dyspnea may have coronary heart disease, congestive heart failure, valvular disorders, and pericardial diseases, as well as secondary causes such as anemia and deconditioning. In this patient, there is evidence of acute dyspnea that is affecting her activities of daily living. Further history and physical exam looking into respiratory and cardiac causes should be sought next.

The patient denies having any cardiac or pulmonary problems and had no limitations in her activity. She noted associated fatigue but denied fever, chills, sweats, lower extremity edema, PND, orthopnea, cough, or hemoptysis. She had not had similar symptoms in the past. The patient was taking an oral contraceptive (OCP). She denied recent air travel or long bus rides. The patient was a nonsmoker, non-drinker, and denies illicit drugs. The patient denies any family history of cardiac or pulmonary problems.

On initial presentation to the ED, the patient was tachycardic (pulse 130), tachypneic (respiratory rate 30), and had a BMI of 57.25 kg/m², but the patient was not hypoxic (spO₂ 95% on room air). Physical exam was unremarkable except for tachycardia. The patient was in mild distress but was able to speak full sentences. The patient's lungs were clear to auscultation. The cardiac exam was unrevealing: there was no right ventricular heave, lower extremity edema, or JVD.

The patient had clear lungs and no history of chronic lung disease, making heart failure, pneumonia, pleural effusion, asthma and COPD exacerbation less likely. Although the patient was not hypoxic, she was clearly tachypneic and tachycardic. The patient's obesity and use of OCP (even without tobacco use) put her at risk for pulmonary embolism. Based on the Wells' Criteria, the patient met 4.5 points (tachycardia and clinical concern for PE as number one diagnosis), despite having no history of previous immobilization or surgery within four weeks, previous DVT/PE or signs of DVT, or hemoptysis. This placed the patient in moderate risk group with a 16.2% chance of having a pulmonary embolus in the Emergency Department.

Chest CT with contrast showed Pulmonary Embolus (PE) with occlusion of right pulmonary artery with low perfusion to the right lung. There was also a sub-segmental clot in the left lung. EKG showed sinus tachycardia without axis deviation or Right ventricle (RV) strain pattern. An echocardiogram showed mildly dilated right ventricle and moderately decreased RV systolic function, but normal Pulmonary artery systolic pressure (PASP). Labs were notable for a Beta Natriuretic Peptide (BNP) of 648 and negative troponins.

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The patient was started on IV heparin following an IV bolus. The OCP was held. The Pulmonary Embolism Response Team (PERT) was consulted. They recommended anticoagulation therapy without lytics.

The patient met criteria for provoked (due to OCP use) submassive pulmonary embolism. She was normotensive, but had evidence of RV dysfunction. The American Heart Association guidelines recommend aggressive re-perfusion therapy (thrombolysis, catheter-directed thrombolysis and/or surgical embolectomy) for massive PE, where patients have sustained hypotension/shock and for patient's who meet the high-intermediate risk category at high concern for clinical deterioration. Due to the patient's clinical improvement, she met criteria for the low-risk intermediate category and anticoagulation therapy was pursued.

While LMWH is usually preferred over IV heparin (UFH) for initial anticoagulation due to lower risks of bleeding and Heparin Induced Thrombocytopenia, UFH is recommended for patients with severe obesity. If warfarin (Coumadin) is selected for maintenance therapy, it should be started as soon as possible in combination with UFH or LMWH for five days and until INR >2. Recent trials have also shown that Direct Oral Anticoagulant (DOAC) are non-inferior in the treatment of PE, may be safer from a bleeding standpoint than heparin/Coumadin, and do not require a heparin bridge; however, these drugs have not been studied in patients with a BMI >40.

The duration of therapy for a provoked PE is three months for all types of anticoagulation options, with a recurrence rate of 2.5% per year.

The patient felt much better by the next morning and had objective signs of improvement. The patient

was discharged on enoxaparin 150 mg sq bid (1 mg/kg) x 3 months. The patient's insurance would not cover a DOAC and the patient wanted to avoid warfarin after watching her friend experience warfarin skin necrosis.

The patient stated that she was very diligent with taking her enoxaparin and was feeling almost back to baseline until 26 days later when she had recurrent acute onset of shortness of breath and pleuritic chest pain. Patient also had fever to 102.8, HR 124, RR 35, WBC 12, and O2 sat 92% on 3 L nasal canula. Chest CT was repeated and showed stable persistent right-sided clot, but had new evolving right-sided lung infarcts. Repeat TTE showed mild-moderate RV dysfunction. Labs were notable for an improved BNP of 59 and negative troponins.

The patient was started on IV heparin. Interventional cardiology felt that there was no role for thrombolysis and favored that the patient be kept on heparin in higher therapeutic range. She was also covered with broad-spectrum antibiotics while cultures were pending. A hypercoagulable workup was unremarkable and lower extremity Doppler's showed no evidence of DVTs.

Hypercoagulable workup often includes factor V Leiden, protein C, protein S, homocysteine and age appropriate cancer screening. It is often not needed in patients with their first PE or provoked PE/DVT.

The patient was clinically improved after treatment with LMWH, but subsequently developed a lung infarct. Interestingly, she had no improvement in her right sided clot after about 4 weeks of treatment. This lack of improvement could be caused by three possibilities: treatment failure, non-adherence/poor absorption, or chronic thrombus. When the patient presented to the ED, a factor Xa level was not

collected before heparin was started, and thus it was unclear whether the patient failed Lovenox therapy or was non-adherent. In addition, lung infarcts can occur despite anticoagulation due to the increased flow through the bronchial circulation and elevation in pulmonary venous pressures therefore LMWH failure cannot be completely assumed. However, given the patient's morbid obesity, the patient was started on a heparin bridge to warfarin.

One month later, the patient's RV size and function were nearly normal on her repeat echocardiogram and her BNP had normalized. This suggests that she did have benefit from anticoagulation.

Learning Points

1. Pulmonary embolism can cause evolving lung infarcts despite anti-coagulation therapy.
2. Obtaining an Xa level in the Emergency Department is imperative if a patient is on Lovenox with a suspected diagnosis of PE to help guide diagnosis and further management.
3. Choosing the correct anticoagulation in obese patients is challenging and more data is needed to assess the efficacy in LMWH and DOACs among patient's with BMI >40.

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