

TBL Summary

Case 1: Pulmonary Embolism

Goals:

- Understand risk factors and effects of thromboembolism.
- Know the appropriate history and physical findings for thromboembolism.
- Appreciate the variety of presentations of PE.
- Create a differential diagnosis for acute fatigue.

What things could be causing her problems?

This is a patient who has decreased exercise capacity that came on fairly quickly. Things that could be causing this could involve decreased oxygenation of the blood or decreased pumping of well oxygenated blood. Additionally, build up of toxins that are normally cleared by the liver or kidney can make people feel crummy.

The list is very broad: pneumonia, problems of heart pumping capacity (rhythm and strength of pumping stroke), anemia, mismatch between pulmonary ventilation and blood flow (pulmonary embolism- PE), acute renal failure, viral illness, etc.

What physical exam findings would you look for?

First, you want to know the vital signs. These can be very helpful. Is the patient febrile, tachycardic (fast heart rate), tachypnic (rapid respirations), hyper or hypotensive, hypoxic? The patient's overall color (looking for pale or jaundice), any rubs, gallops, or muffled heart sounds? Do breath sounds suggest a problem with this system? Is the belly tender? Hypo or hyperactive bowel sounds? What about the swollen leg.... Is the leg hot and red also? Is there any pain? Any other skin changes?

What the labs/imaging studies might show. Keeping in mind that our patient has SOB (what's this?), chest pain with deep and forceful inspiration, and a swollen leg.

Blood count: CBC- looking for anemia and elevated WBC count

Heart: EKG- looking for tachycardia, low voltage, evidence of angina, etc

B-type natriuretic peptide: BNP- shows evidence of an enlarged heart (CHF)

Chest X-ray: CXR- could this be pneumonia? You will also get a peak at the heart size (congestive heart failure), also sometimes PE can have a Westermark's sign, Hampton's hump, atelectasis, or infiltrate

Basic chemistry panel: CMP- Renal failure could make a patient be tired and have a uremia induced pericarditis, liver failure could make someone feel toxic and a low albumin could cause effusions.

Lower extremity ultrasound: LE U/S- a swollen leg is concerning. However, remember a patient can have a PE from a deep venous thrombosis (DVT) that moved to a more proximal location and therefore isn't seen on an ultrasound

Evidence of a clot formation and breakdown: D-dimer- This test comes in two forms now, a latex agglutination and an ELISA. The latex agglutination is not very sensitive. The ELISA is very helpful in ruling out a pulmonary embolism (PE) in someone that you do not think has a PE.

Ventilation/perfusion assessment: V/Q scan- This test has largely been replaced by PE protocol CT scan. V/Q scan is helpful if it is negative (although 1 out of 25 patients with PE will have a negative scan), but any other result will need to be followed up with more definitive tests.

Computerized tomography: CT scan, PE protocol- This imaging has replaced the conventional V/Q scan and pulmonary angiography, and is just as sensitive. Problems are that the patient must be able to receive IV contrast (people with renal insufficiency can not usually) and they must be under a specified weight (approx 300 lbs).

Diagnosis in this case:

This patient has a pulmonary embolism which is when a clot (in this case and usually it's a blood clot, but it could be air or fat) migrates to the pulmonary artery. As described by Virchow (thus Virchow's triad) venous thrombosis is most likely to occur when one or more of the following are present (1) stasis of blood (2) hypercoagulability (generally meaning increased or abnormal clotting factors or decreased control of clotting system), (3) and vascular injury or inflammation. Hemodynamic compromise is a result of a ventilation perfusion mismatch. Deoxygenated blood from the heart is unable to make it to the alveoli to receive oxygen, and in turn, the lung parenchyma void of its normal blood flow can have a loss of surfactant and die.

What you should carry away from this case:

1. Pulmonary embolisms are significantly lethal often because of misdiagnosis since it can present in a variety of ways.
2. Possible presentations of PE:
 - a. Chest pain
 - b. Decreased exercise capacity
 - c. Syncope
 - d. Seizures
 - e. Productive (phlegm or blood) cough
 - f. Abdominal pain
 - g. Atrial fibrillation
 - h. Wheezing
 - i. Fever
 - j. Altered mental status
3. Risk factors for PE:
 - a. Hypercoagulable states: clotting dysfunction (factor V Leiden mutation, protein C, S, or antithrombin III deficiency are the most common), pregnancy, oral contraceptive pills, or malignancy
 - b. Venous stasis from immobility (travel, surgery, or weakness) or hyperviscosity (dehydration, polycythemia, or heart failure)
 - c. Misc items: indwelling intravenous catheter, varicose veins, long bone fractures, inflammatory bowel disease

Treatment Summary

Depends largely on hemodynamic stability of patient and if anticoagulation is contraindicated.

1. Oxygenation
2. Thrombolytics (lysis means to dissolve)
3. Anticoagulation
4. Inferior vena caval filter (yep, this is a filter)
5. Prevention
6. Family matters

Parting 'thought' question

Sometimes a deep leg vein thrombus ends up coming out the aortic valve (left-side of the heart) and therefore does not end up in the lung, rather it causes vascular blockage on the arterial side of the circulation. How can this be explained given the anatomy of the vascular system?