Pulmonary Embolism Presenting With Right Flank Pain

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Pulmonary embolism was the diagnosis in these 3 women, each of whom presented with positional right flank pain.

Three women—all of whom presented with positional right flank pain—all had the same final diagnosis.

Case 1: A woman in her 30s with a history of asthma and migraines and a recent upper respiratory tract infection presents with a 3-day history of right flank pain, which she thinks is a muscle strain from lifting her 3-month-old. The pain is worse with lying down and increased with respirations. She denies fever, hematuria, dysuria, vomiting, and shortness of breath. Her vitals and exam are essentially normal. Urinalysis shows 200 red blood cells. Chest film shows a faint right-sided infiltrate.

Case 2: Another woman in her 30’s presents with 4 days of intermittent right flank pain that is positional. The pain is much worse when she is supine and is relieved by standing up. It has been intermittent, and lasts up to 20 minutes. It also seems like it is difficult for her to take a deep breath. She denies shortness of breath, fever, vomiting, hematuria, and dysuria. She was seen at another emergency department (ED) yesterday, had negative results on urinalysis and was sent home with a diagnosis of biliary colic. Vital signs and physical exam are normal. Urinalysis is negative again today, as is the chest film.

Figure:

Case 3: The third woman was referred to the ED by her pain specialist. She had “refractory” right flank and abdominal pain that had not been relieved by a cholecystectomy: the plan was to do an intercostal rib block Monday in the office. The pain is in the right flank and worse with inspiration and twisting movement or lying on her side. She also has had a cough productive of yellow phlegm and occasional blood, which she had been told was due to bronchitis for which she recently finished a course of antibiotic. Her chest x-ray film is shown (Figure).

Pulmonary embolism (PE) was diagnosed in all 3 patients. The diagnosis was made by ventilation-perfusion scan in 1 patient, and by CT angiogram in 2. Both angiograms demonstrated a lung infarction that had caused a small pleural effusion. The reason the pain was positional was most
likely due to the pleural effusion, which moves with changes in position. A small effusion was also suspected in the patient whose PE was diagnosed by ventilation-perfusion scan.

The chest x-ray film (Figure) shows an elevated right hemidiaphragm—one of many possible chest radiographic findings in the setting of pulmonary embolism. The Table lists other possibilities.

**DISCUSSION**

PE can cause a variety of clinical presentations. The classic presentation of dyspnea, tachypnea, and pleuritic chest pain may only be seen with PEs that are mid-sized. Small PEs tend to lodge distally in the pulmonary circulation where there is little to no collateral circulation and thus cause small peripheral lung infarcts that present primarily with pleuritic pain and occasionally hemoptysis. Dyspnea and alterations in vital signs are unlikely with small PEs. Large PEs tend to lodge more centrally and because of collateral circulation are less likely to cause lung infarction. They are therefore often painless, but because of the degree of vascular obstruction are much more likely to cause dyspnea on exertion and alterations in vital signs, such as tachycardia, hypotension with or without syncope, tachypnea, and hypoxia. Large PEs are also more likely to cause ECG changes and small elevations in troponin and brain natriuretic peptide levels, which may often lead to misdiagnosis of a primary cardiac condition.

Testing for PE if full of pitfalls. Unnecessary testing can be time-consuming and expensive and can expose your patient to large doses of ionizing radiation. On the other hand, a missed PE can be fatal and, as noted, many cases—particularly large or small PEs—present somewhat atypically. Chest films may be normal or may show a variety of findings (see Table). It is most useful to rule out alternative diagnoses and to choose between a ventilation-perfusion scan and a CT angiogram as the diagnostic test.

D-dimer is very useful to rule out PE when used appropriately. Newer-generation assays have high sensitivity but low specificity. When used judiciously, it can obviate the need for a ventilation-perfusion scan or CT, but because of its low specificity, when overused, it can actually cause increased use of these tests because of the high number of false positives. D-dimer should be ordered only when you plan to do a ventilation-perfusion scan or CT scan anyway. If the d-dimer is negative, in most cases the ventilation-perfusion scan or CT scan can be canceled.

The ventilation-perfusion scan is more sensitive than CT for PE, and it also uses significantly less radiation. In general, it should be the test of choice in younger patients with a normal or near-normal chest film and in patients in whom intravenous contrast is contraindicated. CT angiogram is the test of choice when there are significant abnormalities on the chest film or when other conditions, such as aortic dissection, are a consideration. Consider adding a lower extremity duplex to CT because of its lower sensitivity than ventilation-perfusion scanning.

See the Table below for more information on diagnostic testing for PE.

Treatment of PE has traditionally been with heparin followed by warfarin. Many new anticoagulant agents have recently become available, however, and may be used in place of the older agents. Tissue plasminogen activator or embolectomy are occasionally used in addition to heparin for massive PEs. Inferior vena cava filters maybe used when there is a contraindication to anticoagulation.

**Pulmonary Embolism Testing: The Quick Essentials**

| Chest film: | May be normal. Elevated hemidiaphragm >atelectasis >effusion >infiltrate >oligemia >Enlarged pulmonary artery >Westermark sign (vascular cutoff), Hampton’s hump (infarct) |
| D-Dimer: | Sensitivity/Specificity vary by test used and cut-off used (usually between 200 and 500 ng/mL) |
| Pros: | No radiation. Can help tell if clot is acute or chronic in patient with prior DVT or PE Can rule PE if low suspicion, or if high sensitivity test in intermediate suspicion |
| Cons: | Overuse may inappropriately lead to increased advanced testing. Use selectively. |
| False (+): | Traumatic: Surgery in prior 10 days, bruise, puerperium Thrombotic: MI/CVA, dissection, AAA Chronic disease: liver or renal disease, cancer, DM, collagen vascular disease, sickle cell Inflammatory: pericarditis, infection, DIC |
| False (-): | Symptoms >1 wk, on heparin or warfarin or other blood thinner |
V/Q scan: Test of choice in young patient with normal CXR as less radiation and higher sensitivity. Underused, but for no good reason.

Pros: 96%-98% sensitive, radiation = 2mSv, no IV contrast, less expensive than CT
Cons: >1h scan time, doesn’t pick up alternative diagnoses, less specific, should have normal CXR
PIOPED-1: Can rule out PE with normal scan or low suspicion & low probability scan

<table>
<thead>
<tr>
<th>Clinical Suspicion*</th>
<th>Normal VQ</th>
<th>Low prob. VQ</th>
<th>Intermed prob. VQ</th>
<th>High Prob VQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2% had PE</td>
<td>4% had PE</td>
<td>16% had PE</td>
<td>56% had PE</td>
</tr>
<tr>
<td>High</td>
<td>0% had PE</td>
<td>40% had PE</td>
<td>66% had PE</td>
<td>96% had PE</td>
</tr>
<tr>
<td>All</td>
<td>4% had PE</td>
<td>14% had PE</td>
<td>30% had PE</td>
<td>87% had PE</td>
</tr>
</tbody>
</table>

* Note: To determine, use known risks, presentation, CXR & EKG, and likelihood of alternate diagnosis.

CT Angio: 83% sensitive, 83%-96% specific depending on scan quality and reader

Pros: OK if abnormal CXR, may find an unsuspected alternative diagnosis (pneumonia, dissection) More specific than VQ, availability often better, rapid
Cons: More radiation (usually >8-16mSv), IV contrast needed, incidental findings in up to 35%
PIOPED-2: CT Angio only 83% sensitive. If high clinical probability, need a 2nd test to rule out

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