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Pulmonary Embolism: Diagnosis with Computed Tomographic Angiography (Learner's Guide)

I. Objectives

- Learn how to assess the pretest probability of a patient having a pulmonary embolism.
- Understand when a D-dimer is useful in ruling out pulmonary embolism.
- Know when to order and how to apply the results of a multidetector row computed tomographic angiogram (CTA).

II. Case

A 63-year old woman with stage II non-small cell lung cancer calls 911 for acute shortness of breath (SOB). At baseline, she has mild SOB controlled by her inhalers. She is also taking hormone replacement therapy. On the day of admission, she develops a sudden increase in SOB and new pleuritic chest pain. She does not improve with nebulizer treatment on the way to the hospital. In the ER, her pulse is 115, RR = 36, temp = 100.1°F and O₂ sat = 88% on room air. On exam, her lungs are clear, and her extremities are normal. A chest x-ray (CXR) shows mild right-sided atelectasis. An ABG shows pH = 7.48, PCO₂ = 32 mm Hg and PO₂ = 50 mm Hg on room air.

What is this patient's pretest probability for having a pulmonary embolism?³

The ER physician orders a D-dimer, which comes back negative. Does this patient require any further work-up?³

You decide to order a chest CTA on this patient. If the CTA does not show a pulmonary embolism, what are the chances that this is a false-negative, and that the patient really does have a PE? What further work-up, if any, is required?^{1,2}

If the CTA confirms a pulmonary embolism, what are the chances that the patient truly has a pulmonary embolism? (I.e., what is the positive predictive value?)

**How accurate is ventilation-perfusion (V/Q) scanning compared to CTA?²
Would a V/Q scan be an appropriate test in this patient?**

III. Questions for Further Discussion

If the CT shows an isolated, subsegmental pulmonary embolism, what would be the appropriate management?^{1,2}

IV. Key Articles

1. Perrier A, *et al.* Multidetector-row computed tomography in suspected pulmonary embolism. *NEJM* 2005; 352: 1760-8. [FULL TEXT](#) [PDF](#)
2. Anderson D, *et al.* Computed tomographic pulmonary angiography vs. ventilation-perfusion lung scanning in patients with suspected pulmonary emboli: a randomized controlled trial. *JAMA* 2007; 298: 2743-53. [PDF](#)

V. Reference Articles

3. Le Gal G, *et al.* Prediction of pulmonary embolism in the emergency department: the Revised Geneva Score. *Ann Int Med* 2006; 144: 165-71. [PDF](#)

VI. Resources