



EM CASES SUMMARY

Episode 114 – Pulmonary Embolism Challenges in Diagnosis Part 2

With Drs. Kerstin de Wit & Eddy Lang

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In Part 1 of Pulmonary Embolism Challenges in

Diagnosis Drs. Helman, Lang and DeWit discussed a workup algorithm using PERC and Wells score, the bleeding risk of treated pulmonary embolism, pearls in decision making on whether or not to work up a patient for pulmonary embolism, how risk factors contribute to pretest probability, the YEARS criteria and age-adjusted D-dimer. In this Part 2 we answer questions such as: what are the important test characteristics of CTPA we need to understand? Which patients with subsegmental pulmonary embolism should we treat? When should we consider VQ SPECT? What is the best algorithm for the work up of pulmonary embolism in pregnant patients? How best should we implement pulmonary embolism diagnostic decision tools in your ED? and many more...

CTPA test characteristics and pulmonary embolism diagnosis

As with the rest of emergency medicine, our interventions are rarely benign. In order to avoid unnecessary radiation and major bleeding complications as a result of anticoagulating

patients with false positive CTPA results, it's important to have a rational approach to imaging for PEs as well as a good approach to shared decision making with our colleagues, our radiologists and our patients.

Although CTPA has become the gold standard for diagnosing PE and remains the best imaging modality available, it is far from perfect. The CTPA is prone to over-diagnosing clinically irrelevant emboli in low-risk patients [1]. Furthermore, although its sensitivity approaches 100% for clinically relevant PEs, in those with high pre-test possibility there is a small chance a clot might be missed. Those patients at high risk for PE based on a Wells score >6 with a negative CTPA should be counseled that although the present CTPA does not show a PE, up to 5% of high risk patients may develop a PE within a few months of a negative CTPA [2,3].

What about clot burden and location? These imaging characteristics have not been shown to accurately predict outcome, or even symptoms. The clinical context is much more important, and markers such as hypotension and hypoxia are better predictors of outcome [4].

Subsegmental PE: To treat or not to treat?

In the last 10 years, the incidence of diagnosed PE has doubled, despite no change in mortality, partly due to advances in CT technology and partly due to radiologists overcalling subsegmental PEs due to medico-legal concerns. With modern CTs, subsegmental PEs are more often diagnosed. Although there is some variability in practice, most emergency physicians end up treating subsegmental PEs. *But should we?*

An observational study by Goy et al. in 2015 reviewed 2213 patients with a diagnosis of subsegmental PE, and showed that whether or not anticoagulation was given, there were no recurrent PEs, yet 5% of anticoagulated patients developed life-threatening bleeding [5]. Other studies have yielded similar results [6].

Shared decision-making. Consider the patient's bleeding risk (**HASBLED** score) and discuss potential treatment options. The 2018 ACEP Clinical Policy on Acute Venous Thromboembolic Disease gives withholding anticoagulation in patients with subsegmental PE a Level C recommendation and states: "Given the lack of evidence, anticoagulation treatment decisions for patients with subsegmental PE without associated DVT should be guided by individual patient risk profiles and preferences [Consensus recommendation]."

Start anticoagulation for subsegmental PE in the ED with an expectation that anticoagulation may be stopped in follow-up. While the risk of major bleeding with a full course of anticoagulation is significant, the risk of bleeding with a few doses of anticoagulant is very low. Thus, starting treatment for subsegmental PE in the ED and referring the patient for early timely follow up in a thrombosis or internal medicine clinic (within a few days) is a reasonable option. Counseling your patient that the consultant may recommend stopping the anticoagulant is essential to avoid conflicting messages. Consultants may risk stratify low risk patients with serial leg dopplers to direct ongoing therapy.

V/Q Scan

Many emergency physicians are comfortable using D-dimers, dopplers and CTPA, but often forget about the value of V/Q scans [8]. Consider this test in:

- Young, otherwise healthy patients with a normal chest x-ray
- CT contrast allergy

V/Q SPECT

V/Q SPECT has been shown to have superior accuracy compared to traditional V/Q and has similar sensitivity, but poorer specificity compared to CTPA for pulmonary embolism [9]. V/Q SPECT eliminates intermediate probability scans, and is reported dichotomously as positive or negative for PE. This avoids the ambiguity of results in traditional V/Q. Robust data is pending regarding its diagnostic utility compared to CTPA.

Pregnancy and PE

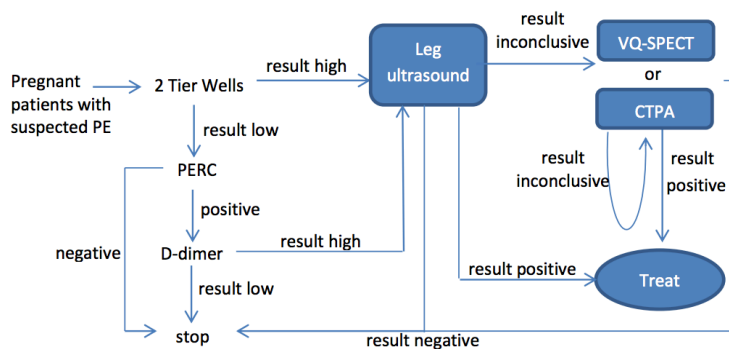
There are many proposed strategies for working up the pregnant patient for PE, but no diagnostic algorithm has robust enough evidence for strong recommendations [10,11,12]. Pregnant women have generally been excluded from the studies that have provided support for the use of clinical prediction tools and D-dimer in the diagnosis of pulmonary embolism.

Although a trimester-adjusted D-dimer (cutoffs increase by 250 for each trimester) has been suggested for PE in pregnancy, it is not recommended by our experts. While the DiPEP study could not find a D-dimer threshold below which PE could be ruled out in

pregnancy [13], there is some observational evidence that a negative D-dimer result rules out PE in otherwise low-risk pregnant patients. A retrospective review of 152 pregnant and post-partum patients who underwent V/Q or CTPA for suspected PE found a sensitivity of 100% but only a specificity of 42% [14]. The American Thoracic Society recommends not using D-dimer in pregnancy [15].

The European Society of Cardiology recommends considering V/Q scan to rule out suspected PE in pregnant women with normal CXR (Class IIB recommendation) and that CTPA should be considered if the CXR is abnormal or if V/Q scan is not readily available (Class IIa recommendation) [16].

Our experts recommend starting with two-tier Wells and PERC, an unadjusted D-dimer if necessary, then moving onto bilateral leg dopplers, and then considering chest imaging based on the CADTH Optimal Strategies for the Diagnosis of Acute Pulmonary Embolism 2018 Recommendations [17].



Can leg dopplers rule PE in or out? Ultrasound shows a DVT in up to 30-50% of patients with PE, and finding a proximal DVT in patients suspected of having PE is considered sufficient to warrant anticoagulation without further testing [18]. A negative Doppler ultrasound for DVT does not rule out a PE.

Radiation Risk in pregnancy: CTPA vs. V/Q

A CTPA transmits more radiation to the maternal breast tissue, whereas a V/Q scan transmits more radiation to the fetus. There is no hard data here to guide practice and specific strategies remain controversial. However, it is important to realize that both VQ and CTPA fetal radiation dose falls well below teratogenic doses. In the ED, discuss radiation risk with your patient and the radiologist on-call to determine the best imaging modality.

Departmental Decision Support

Our experts encourage every ED to develop a protocol for PE diagnosis to maintain consistency and promote institutional support for clinicians. If implemented thoughtfully with input from the physician group, this practice could lead to reduced imaging rates and increased diagnostic yield [19]. However, changing ED culture may be challenging, and results depend on the point of implementation to affect diagnostic momentum.

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