

Pulmonary Emboli

Who can you send home?

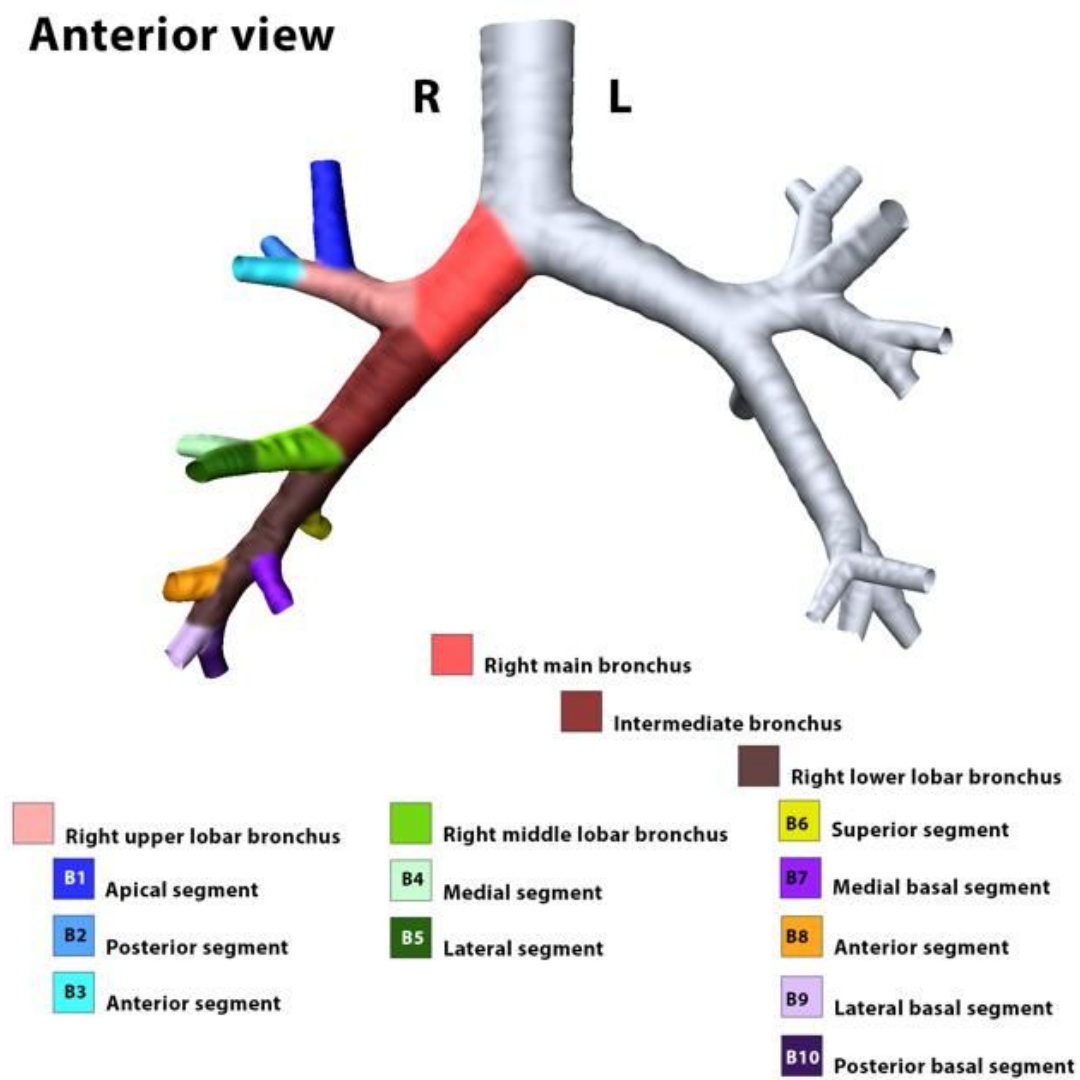
Controversy

- + Current evidence does not suggest discharging proven diagnosed pulmonary embolism home.
- + What you see is not always what you get!
- + Subsegmental PE's may be a phenomena of newer generation multi-slice CT scanners that have no clinical relevance.
- + Function of lungs may be a giant filter that captures small PE's constantly thus preventing spread to the left side of the heart and brain.

Controversy

- + To treat or not to treat a subsegmental pulmonary emboli (PE)?
- + More CT scans are being done than ever before and more PEs are being diagnosed yet overall mortality rate has not changed.
- + One school of thought states that if on a positive CTA with only a diagnosis of subsegmental PE you subsequently perform bilateral lower extremity venous dopplers and if this is negative you can discharge the patient home.
- + Opposing camp states you are treating to prevent the subsequent more lethal PE.

Anterior view



Overdiagnosis of PE by Pulmonary CT Angiography

+American Journal of Roentgenology, 2015 Aug.205(2).271-7

+ **Objective:** To evaluate the rate of overdiagnosis of PE by pulmonary CT angiography in a tertiary care university hospital.

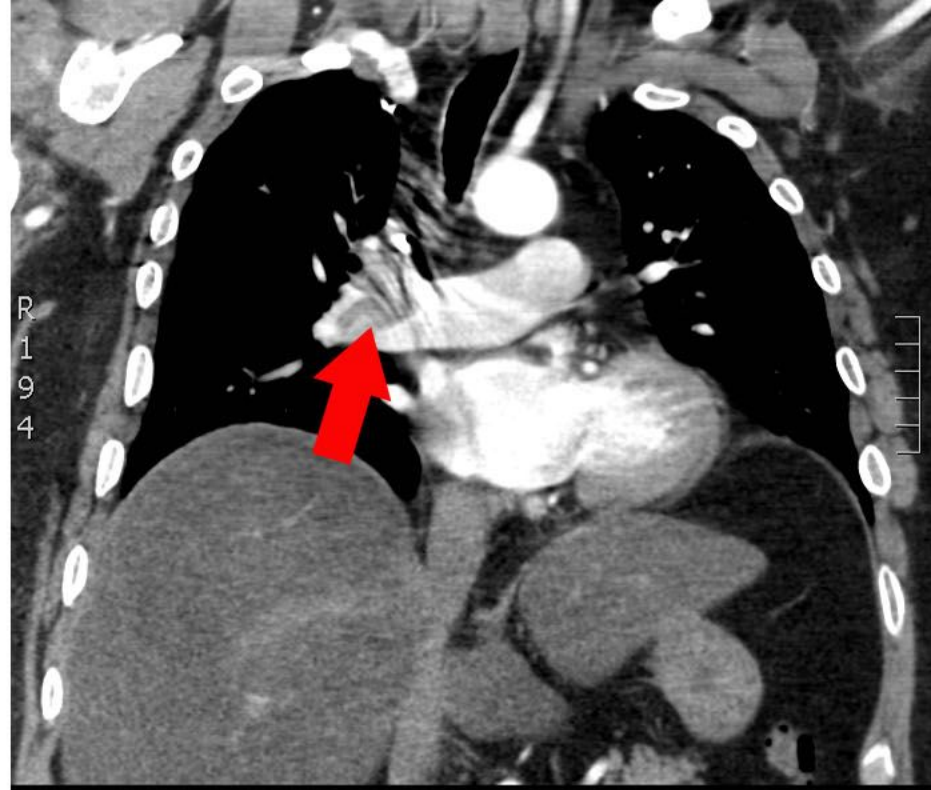
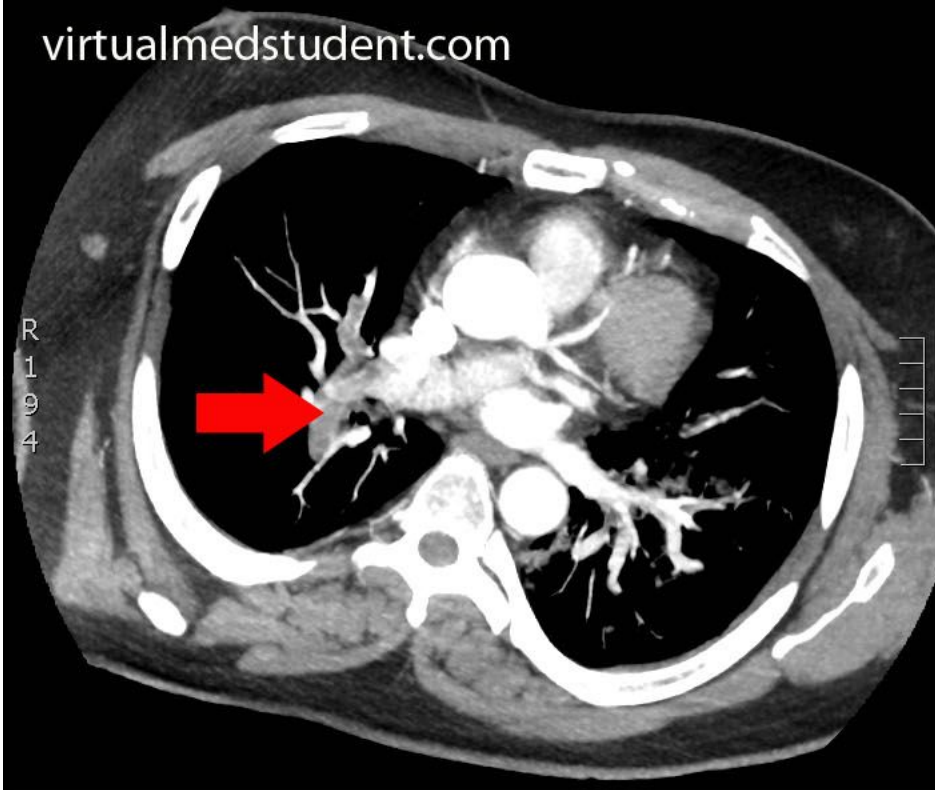
+**Methods;** Retrospective review of CT exams over 12 month period. Positive studies were retrospectively reviewed by three subspecialty chest radiologists with > 10 years experience. A CTA was considered negative if all 3 radiologists were in agreement.

+**Results:** Total of 837 CTA's were performed over the study period. Of these 174 or 18.6% were positive. Discordance rate was 26%.

Overdiagnosis of PE by Pulmonary CT Angiography

+Results: Discordance occurred more often where the original reported PE was solitary (42% of solitary PE's were considered negative on retrospective review) and located in a segmental or subsegmental pulmonary artery. (27% and 59% respectively). The most common cause of diagnostic difficulty was breathing motion artefact.

+Conclusion: In routine clinical practice, PE's diagnosed by pulmonary CTAs are frequently overdiagnosed, when compared with the consensus opinion of a panel of expert chest radiologists. Improvement in the quality of pulmonary CTA examination and increased familiarity with potential diagnostic pitfalls are recommended to minimize misdiagnosis of PE.



The areas at the tip of the arrowheads are slightly “darker” than normal indicating a decreased ability for contrast dye to enter the pulmonary artery and its branches. This is indicative of a pulmonary embolism (ie: a blood “clot” in the blood vessels of the lung).

Proponents of Discharging Home Subsegmental Pulmonary Embolisms

Propose treating only those that have active cancer or a prior history of PE.

†These patients are treated for life and this follows guidelines. There are a group of patients with subsegmental PE that need to be on anticoagulation, not because of what was seen on CT scan but rather their overall risk of recurrent PE.

Most of these patients will have a negative D-dimer

What is the evidence?

Subsegmental pulmonary embolism diagnosed by computed tomography: incidence and clinical implications. A systematic review and meta-analysis of the management outcome studies.

[J.Thromb Haemost.](#) 2010 Aug;8(8):1716-22

Abstract

BACKGROUND:

Multiple-detectors computed tomographic pulmonary angiography (CTPA) has a higher sensitivity for pulmonary embolism (PE) within the subsegmental pulmonary arteries as compared with single-detector CTPA. Multiple-detectors CTPA might increase the rate of subsegmental PE diagnosis. The clinical significance of subsegmental PE is unknown. We sought to summarize the proportion of subsegmental PE diagnosed with single- and multiple-detectors CTPA and assess the safety of diagnostic strategies based on single- or multiple-detectors CTPA to exclude PE.

PATIENTS AND METHODS:

A systematic literature search strategy was conducted using MEDLINE, EMBASE and the Cochrane Register of Controlled Trials. We selected 22 articles (20 prospective cohort studies and two randomized controlled trials) that included patients with suspected PE who underwent a CTPA and reported the rate of subsegmental PE. Two reviewers independently extracted data onto standardized forms.

RESULTS:

The rate of subsegmental PE diagnosis was 4.7% [95% confidence interval (CI): 2.5-7.6] and 9.4 (95% CI: 5.5-14.2) in patients that underwent a single- and multiple-detectors CTPA, respectively. The 3-month thromboembolic risks in patients with suspected PE and who were left untreated based on a diagnostic algorithm including a negative CTPA was 0.9% (95% CI: 0.4-1.4) and 1.1% (95% CI: 0.7-1.4) for single- and multiple-detectors CTPA, respectively.

CONCLUSION:

Multiple-detectors CTPA seems to increase the proportion of patients diagnosed with subsegmental PE without lowering the 3-month risk of thromboembolism suggesting that subsegmental PE may not be clinically relevant.

Risk profile and clinical outcome of symptomatic subsegmental acute pulmonary embolism.

[den Exter PL](#)¹, [van Es J](#), [Klok FA](#), [Kroft LJ](#), [Kruip MJ](#), [Kamphuisen PW](#), [Büller HR](#), [Huisman MV](#).

Author information

Abstract

The clinical significance of subsegmental pulmonary embolism (SSPE) remains to be determined. This study aimed to investigate whether SSPE forms a distinct subset of thromboembolic disease compared with more proximally located pulmonary embolism (PE). We analyzed 3728 consecutive patients with clinically suspected PE. SSPE patients were contrasted to patients with more proximal PE and to patients in whom suspected PE was ruled out, in regards of the prevalence of thromboembolic risk factors and the 3-month risks of recurrent venous thromboembolism (VTE) and mortality. PE was confirmed in 748 patients, of whom 116 (16%) had SSPE; PE was ruled out in 2980 patients. No differences were seen in the prevalence of VTE risk factors, the 3-month risk of recurrent VTE (3.6% vs 2.5%; $P = .42$), and mortality (10.7% vs 6.5%; $P = .17$) between patients with SSPE and those with more proximal PE. When compared with patients without PE, aged >60 years, recent surgery, estrogen use, and male gender were found to be independent predictors for SSPE, and patients with SSPE were at an increased risk of VTE during follow-up (hazard ratio: 3.8; 95% CI: 1.3-11.1). This study indicates that patients with SSPE mimic those with more proximal PE. When compared with patients without PE, aged >60 years, recent surgery, estrogen use, and male gender were found to be independent predictors for SSPE, and patients with SSPE were at an increased risk of VTE during follow-up (hazard ratio: 3.8; 95% CI: 1.3-11.1). This study indicates that

- This study did not look at concurrent DVT. Almost all agree that patients with subsegmental PE *and* DVT should be treated. Many of the patients in this study with subsegmental PE also had active cancer.
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- Even though it was not statistically significant, mortality and recurrent VTE was higher in the subsegmental PE group compared to the other PE group. This suggests that the patients in the subsegmental PE group were sicker.

Argument for Treating All SSPE's

A study found 11% of scans reported as subsegmental PE were negative but 37% actually had segmental PE.



Difference in interpretation of computed tomography pulmonary angiography diagnosis of subsegmental thrombosis in patients with suspected pulmonary embolism.

[Pena E](#), [Kimpton M](#), [Dennie C](#), [Peterson R](#), [LE Gal G](#), [Carrier M](#).

Argument Against sending SSPE Home

We just don't have enough high level evidence.

- A recent study in the radiology literature found that 14 patients with missed PE who were not receiving anticoagulation developed new pulmonary embolism and this included 9 patients who had an isolated subsegmental PE on the initial scan. **This is why we treat pulmonary embolism; to prevent recurrence.**

Missed pulmonary emboli on CT angiography: assessment with pulmonary embolism-computer-aided detection.

[Kligerman SJ](#)¹, [Lahiji K](#), [Galvin JR](#), [Stokum C](#), [White CS](#).

OBJECTIVE:

The purpose of this study is to assess the use of a pulmonary embolism (PE)- computer-aided detection (CADx) program in the detection of PE missed in clinical practice.

MATERIALS AND METHODS:

Pulmonary CT angiography (CTA) studies (n = 6769) performed between January 2009 and July 2012 were retrospectively assessed by a thoracic radiologist. In studies that were positive for PE, all prior contrast-enhanced pulmonary CTA studies were reviewed. Missed PE was deemed to have occurred if PE was not described in the final interpretation. The presence, proximal extent, and number of PEs were agreed on by three thoracic radiologists. Studies with missed acute PE and available slice thickness of 2 mm or less were assessed with a prototype PE-CADx program. False-positive PE-CADx marks were analyzed. Outcomes of missed acute PEs were assessed in patients with both follow-up imaging and clinical data.

RESULTS:

Fifty-three studies with overlooked acute PE met our inclusion criteria for PE-CADx assessment. The PE-CADx program identified at least one PE in 77.4% of instances (41/53). PE-CADx correctly marked at least one PE in 23 of 23 cases (100%) with multiple PEs and 18 of 30 (60%) cases with a solitary PE ($p < 0.001$). PE-CADx per-study sensitivity was significantly higher for segmental (65.5%) than for subsegmental (91.7%) PEs ($p = 0.002$). PE-CADx averaged 3.8 false-positive marks per case (range, 0-23 marks). Fourteen patients with missed PE who were not receiving anticoagulation therapy developed new PEs, including nine with an isolated subsegmental PE on the initial CT scan.

CONCLUSION:

PE-CADx correctly identified 77.4% of cases of acute PE that were previously missed in clinical practice.