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# A 59-Year-Old Man with Shortness of Breath and Syncope

*Sarah Jordan, Joseph Gresens, MD, Richard Marshall, MD, Stephen Kantrow, MD, Fred A. Lopez, MD*

## INTRODUCTION

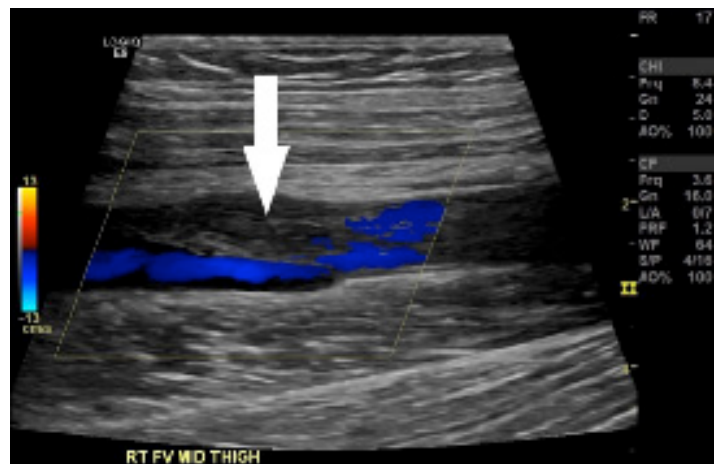
A 59 year-old man with diabetes mellitus type 2 and chronic pancreatitis secondary to alcohol abuse presented to the emergency department due to new onset exertional dyspnea after walking a city block; two episodes of syncope; and associated nausea and vomiting. The patient had driven from California to New Orleans in the previous month. He had no history of dyspnea or syncope previously. He denied cough, chest pain or palpitations and was a lifelong nonsmoker.

The patient's vital signs included a temperature of 98.5° Fahrenheit; pulse of 123 beats per minute; blood pressure of 129/102mmHg; oxygen saturation of 94% on two liters nasal cannula; and a respiratory rate of 31 breaths per minute. The patient was six feet tall and weighed 185 pounds with a BMI of 25.1 kg/m<sup>2</sup>.

On exam the patient was diaphoretic and in mild distress. He was tachycardic but no murmurs or extra heart sounds were appreciated. The patient was tachypneic, but otherwise clear bilaterally on auscultation. Significant laboratory studies included an arterial blood gas showing a pH of 7.25; pCO<sub>2</sub> of 18 mm Hg (35-45mmHg) and pO<sub>2</sub> 115mmHg (80-100mmHg), troponin of 1.5 ng/mL (< 0.01 ng/mL) and an elevated BNP at 288 pg/mL (< 100 pg/mL).

A chest X-ray revealed no acute cardiopulmonary abnormalities. A lower extremity ultrasound demonstrated thromboses in the right middle and distal femoral veins (Figure 1). An echocardiogram showed right ventricular failure with a pulmonary artery pressure estimated at 36-40mmHg (normal < 25mmHg). A pulmonary CT angiogram followed the initial testing and revealed large bilateral pulmonary emboli with reflux of contrast into the IVC consistent with right ventricular strain. (Figure 2a)

The patient underwent catheter-based thrombolysis with low dose catheter directed tissue plasminogen activator (tPA) and systemic anticoagulation with heparin(Figures 2b, 3a, 3b,

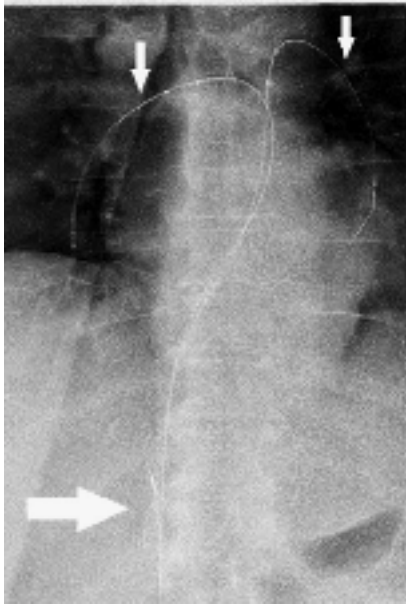


**Figure 1. Right lower extremity ultrasound with color flow Doppler showing hypoechoic clot (arrow) extending through a venous valve in the femoral vein and flowing blood indicated by blue color.**

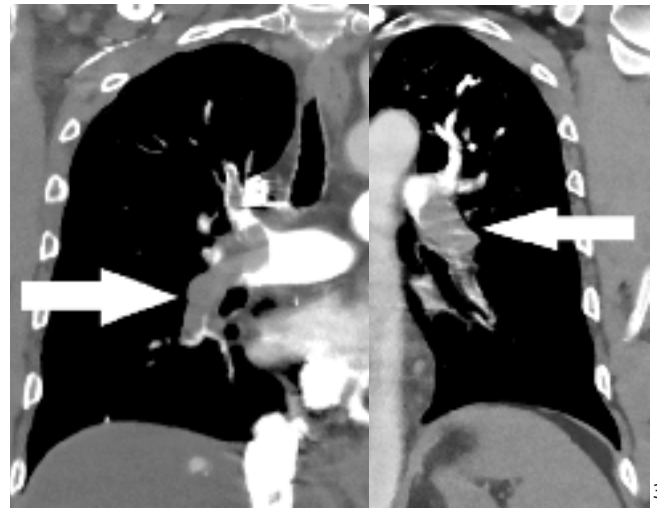
3c). An inferior vena cava filter was also placed due to lower extremity clot burden. The patient was continued on a tPA infusion and systemic anticoagulation. A repeat pulmonary angiogram showed residual clot burden, and the tPA was continued overnight. However, the following day the patient had one episode of brown emesis and the heparin and tPA were stopped. The patient's hemoglobin and hematocrit decreased, but the patient never became symptomatic. The patient had no further episodes of emesis and the heparin was restarted. A repeat pulmonary angiogram on day 2 of hospitalization showed complete resolution of the thrombus along with a main pulmonary artery pressure of 12mmHg (< 25mmHg). The patient was transitioned to apixaban 10mg orally twice daily. The patient continued to clinically improve and was discharged home in stable condition with instructions to continue the apixaban.



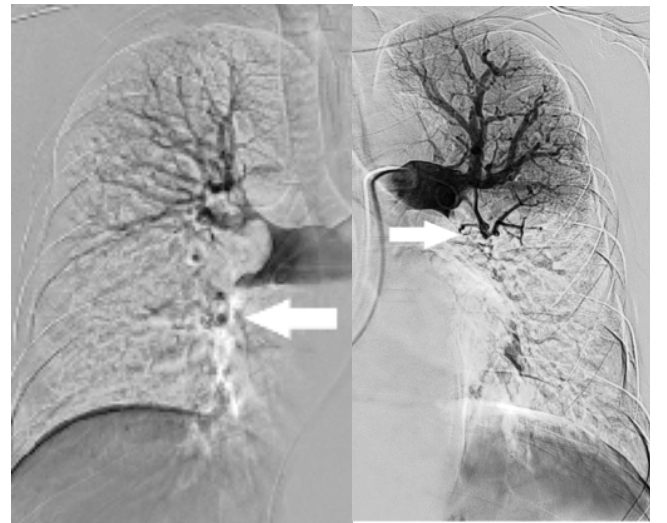
2a



2b



3a



3b



3c

Figure 2 a.) CTA of the chest using pulmonary embolism protocol shows enlargement of the right ventricle relative to the left (RV/LV ratio). The right ventricle is larger than the left ventricle which indicates elevated pulmonary artery pressure in this circumstance. b) Fluoroscopy image in the anterior to posterior projection (AP) shows bilateral pulmonary artery infusion catheters (small arrows) and an inferior vena cava filter (large arrow) placed at the time of the procedure to prevent further pulmonary embolism.

Figure 3. a) CTA examination using pulmonary embolism protocol in the coronal plane shows large pulmonary emboli extending from distal left and right pulmonary arteries into inter-lobar/descending pulmonary arteries (arrows). b) Digital subtraction angiograms (DSA) show pulmonary emboli occluding inter-lobar/descending pulmonary arteries (arrows) with no flow into the middle and lower lobes on each side. c) DSA after slow infusion of thrombolytic agent showing resolution of clot in the pulmonary arteries with dramatic improvement in perfusion of both lungs. Middle and lower lobes are now visible.

## DISCUSSION

### *Epidemiology:*

Venous Thromboembolism (VTE), including Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE), is a complex disease with multiple risk factors. It has an incidence rate that has been reported between 104-183/100,000 person-years with a slight male predominance. In women it is more frequently seen during child-bearing years.<sup>1</sup> It is the third most common cardiovascular disease after myocardial infarction and stroke and has a higher mortality rate than myocardial infarction, due mainly to the ease of detection and more treatment options for MI.<sup>2</sup> The mortality from pulmonary embolism has been reported to be around 10 per 100 person-years.<sup>3</sup> There are multiple risk factors that increase the risk of VTE, including male sex, history of cancer, increased BMI, peripherally inserted central catheters, and history of immobility or surgery. Mortality in VTE is due most frequently to an underlying malignancy, comorbid cardiovascular disease, or recurrent pulmonary embolism.<sup>2,4</sup>

### *Diagnosis:*

The diagnosis of VTE can be challenging. In a large review of patients in six countries in Europe, 59% of patients who died ultimately from pulmonary embolism, were not diagnosed as such until autopsy. 75% of VTE related deaths in this group were hospital-related.<sup>5</sup> The American College of Chest Physicians (ACCP) has published guidelines for the diagnosis and management of VTE. There are multiple predictive tools and the two most commonly used are the Pulmonary Embolism Rule Out (PERC) tool and the Wells criteria. A D-Dimer should may be used to rule out those with low risk for pulmonary embolism based on a risk scoring system.

With a sufficient clinical suspicion for PE, there are several diagnostic modalities that can help diagnose pulmonary embolism. V/Q scans were more frequently used to aid in diagnosis prior to the widespread use of CT pulmonary angiogram. V/Q scans are used less now, and most often only when contrast is contraindicated in the patient: most frequently due to allergies, acute kidney injury or renal failure. V/Q scans are interpreted as high, intermediate, or low probability, or normal. The PIOPED study from the *Journal of the American Medical Association (JAMA)* in 1990, studied 931 patients who received V/Q scans and 755 were then tested with the gold standard of the time; pulmonary angiogram. In the PIOPED study a high probability scan was correlated with PE 87% of the time, and when coupled with high index of suspicion; 96%. This study revealed several limitations with V/Q scans. The majority of scans are not read as high probability. The majority of patients who did not have a PE did not have normal study. 33% of intermediate probability scans and 16% of low probability scans were found to have PE.<sup>6</sup> In a meta-analysis of 693 patients, a negative scan had only a 0.3% incidence of having a pulmonary embolism.<sup>7</sup> Since the early 1990s, CT pulmonary angiography (CTPA) scans have replaced V/Q scans to evaluate acute PE. Published studies

have reported sensitivity and specificity rates between 57-100% and 78-100% respectively.<sup>8</sup> The majority of studies report values above 90% for both sensitivity and specificity. There has been a large increase in the use of CTPA scans in both the emergency department and inpatient setting.

Ultrasound testing in the emergency department and inpatient setting can aid in the diagnosis of PE while decreasing risks associated with radiation and contrast. Lower extremity ultrasound is a highly specific test for evaluating DVT. An emergency department study (n=756) evaluated patients with concern for PE. After ruling out 232 patients by D-dimer, the remaining patients had a CTPA scan and lower extremity ultrasound. The result revealed a sensitivity of 39% and specificity of 99%.<sup>9</sup> While a negative test should lead to further investigation in patients where there is still concern for PE, a positive test is sufficient to begin treatment for PE/DVT, without further testing or need for exposure to contrast or radiation. Transthoracic echocardiography (TTE), which was used in this case, can serve an important role in the diagnosis of PE. The McConnell sign revealing right mid-ventricular free wall akinesia and apical sparing in PE was found to have a sensitivity and specificity of 77% and 94% respectively in selected patients.<sup>10</sup> Rarely a large central pulmonary artery clot or clot-in-transit within the right heart can be seen directly on TTE. In unselected patients the sensitivity of TTE for pulmonary embolism approaches 50%,<sup>11</sup> thus making it a poor initial test for primary diagnosis. However, for patients with massive PE who are too unstable to be transported for testing, right-heart strain can supports the clinical diagnosis. Abnormalities on TTE can be used to risk-stratify patients with acute PE.

### *Treatment:*

Risk stratification is important to determine how aggressive to be with treatment for acute PE. The Pulmonary Embolism Severity Index (PESI) was initially researched and published in 2005, with eleven variables figuring into a score that stratified patients into five categories, with Class I having a mortality of 0-1.6% and Class V having a mortality of 17.9-24.5%.<sup>12</sup> Subsequent research has validated and attempted to simplify the number of variables needed to evaluate the severity of PE. In 2016, a further modified PESI score called modified s-PESI which incorporates two new variables has been proposed: PaO<sub>2</sub>/PaCO<sub>2</sub> and evidence of right heart strain via echocardiography. Inclusion of these variables improved the specificity of one year mortality from 37.7% to 79.4%.<sup>13</sup>

While there is less controversy in the management of uncomplicated PE, some questions remain regarding management of massive and submassive PE. Uncomplicated PE, that is PE without evidence of elevated right heart pressures or enlarged right ventricular diameter compared to the left ventricle, hypotension, or significant hypoxia can be managed acutely with unfractionated or low molecular weight herapin or fondapaninix.<sup>14</sup> Massive and submassive PE have been defined by the American Heart Association.<sup>15</sup>

Massive PE is defined as a PE that causes sustained systolic blood pressure <90 mmHg (without another competing cause), pulselessness, or profound bradycardia. Mortality from massive PE has been reported to be between 25%-52.4%, and much higher in patients with cardiac arrest. Submassive PE is defined by certain echocardiographic findings including, RV strain or dysfunction, RV:LV diameter ratio >0.9 on CT scan, increased troponin and BNP or NT-proBNP, when there is no evidence of shock.<sup>15</sup> According to ACCP current recommendations, which were last updated in 2012, thrombolytic therapy is reserved for acute PE associated with systemic hypotension, SBP <90 mmHg (massive PE); however, the recommendation also suggests that if there is a "high risk of developing hypotension" then thrombolytic therapy can be initiated. These recommendations were based primarily on the PIETHO study that examined 1,005 patients with submassive PE randomized to either tPA or placebo along with heparin. The results showed no significant difference in mortality at 30 days (2.4% vs 3.2%) and a significant decrease in hemodynamic decompensation in the treatment group.<sup>16</sup> Initial recommendations suggest that catheter-directed tPA (CDT) be reserved for patients at high risk of bleeding from systemic thrombolytics. Catheter directed tPA is suggested in the guidelines over no intervention for patients who have "(i) contraindications to thrombolysis, (ii) failed thrombolysis, or (iii) shock that is likely to cause death before systemic thrombolysis can take effect (eg, within hours)."<sup>14</sup> The use of systemic tPA has been studied for patients with submassive PE. In a randomized controlled trial survival was low and found to be no different between patients treated with tPA and heparin vs. heparin only. The only major difference was the clinical endpoint of "escalation of care." This was defined primarily as the need for pressors or secondary thrombolysis. 23.2% of patients needed secondary thrombolysis vs 7.6% in the treatment group.<sup>17</sup> Guidelines still recommend that in the setting of shock and massive PE that the treatment of choice in addition to anticoagulation is systemic tPA. This is especially true if the patient is at a hospital where catheter-directed tPA is not routinely done.

Since these recommendations were published, there have been several large studies that have explored the safety and efficacy of catheter-directed thrombolysis. There have been few randomized control trials, and several prospective and retrospective reports on the effectiveness of catheter-directed thrombolysis. In one randomized controlled trial, (n=59) patients with RV strain on CT scan were given either Heparin or Ultrasound assisted and catheter-directed thrombolysis. There was no survival difference between the two groups, (3 vs 1 minor bleeding events, though not significant, in the CDT group). However the ultrasound assisted CDT group showed a faster resolution of right heart strain as evidenced by a decrease in RV diameter at 24 hours.<sup>18</sup> Previous reports of major bleeding in systemic thrombolysis have been reported at between 2-5%. To date there have been no studies demonstrating superior performance of CDT as compared to tPA, and in fact there have been no studies that have prospectively compared CDT to systemic tPA for massive or submassive PE.

## CONCLUSION

In summary, pulmonary embolism is a common disease which carries a significant risk of death and prolonged hospitalization. Treatment for PE is determined mainly by the clinical burden of disease and the presence of shock and to a certain extent cardiac instability. Current guidelines support the use of tPA in patients with shock. In certain circumstances, and in a center with expertise, CDT can be utilized. More prospective studies comparing catheter-directed tPA to systemic tPA are needed. Since the overall short-term survival of submassive PE is generally excellent, studies should work to determine if rapid resolution of clot as was seen in our patient leads to a decrease in long term complications of PE like chronic thromboembolic pulmonary hypertension.

## REFERENCES

1. Heit JA. Epidemiology of venous thromboembolism. *Nature Reviews Cardiology* 2015;12:464-474.
2. Goldhaber SZ. Venous thromboembolism: epidemiology and magnitude of the problem. *Best Pract Res Clin Haematol.* 2012;25:235-242.
3. Gouin B, Blondon M, Jiménez D, Fernández-Capitán C, Bounameaux H, Soler S, Duce R, Sahuquillo JC, Ruiz-Giménez N, Monreal M; RIETE investigators. Clinical prognosis of non-massive central and non-central pulmonary embolism: a registry-based cohort study. *Chest* 2017; 151:829-837.
4. Tagalakis V, Patenaude V, Kahn SR, Suissa S. Incidence of and mortality from venous thromboembolism in a real-world population: the Q-VTE Study Cohort. *Am J Med* 2013;126:832.e13-21.
5. Cohen AT, et al. VTE Impact Assessment Group in Europe (VITAE). Venous thromboembolism (VTE) in Europe. The number of VTE events and associated morbidity and mortality. *Thromb Haemost.* 2007;98:756-764.
6. PIOPED Investigators. Value of the Ventilation/Perfusion Scan in Acute Pulmonary Embolism Results of the Prospective Investigation of Pulmonary Embolism Diagnosis (PIOPED). *JAMA* 1990;263:2753-2759.
7. van Beek. Lung scintigraphy and helical computed tomography for the diagnosis of pulmonary embolism: a meta-analysis. *Clinical and Applied Thrombosis-Hemostasis* 2001; 7:87-92.
8. Hiorns MP, Mayo JR. Spiral computed tomography for acute pulmonary embolism. *Can Assoc Radiol J* 2002; 53: 258-268.
9. Le Gal G, Righini M, Sanchez O, Roy PM, Baba-Ahmed M, et al. A positive compression ultrasonography of the lower limb veins is highly predictive of pulmonary embolism on computed tomography in suspected patients. *Thromb Haemost* 2006; 95:963-966.
10. McConnell MV, Solomon SD, Rayan ME, Come PC, Goldhaber SZ, Lee RT. Regional right ventricular dysfunction detected by echocardiography in acute pulmonary embolism. *Am J Cardiol* 1996; 78:469-473.
11. Miniati M, Monti S, Pratali L, Di Ricco G, Marini C, et al. Value of transthoracic echocardiography in the diagnosis of pulmonary embolism: results of a prospective study in unselected patients. *Am J Med* 2001; 110:528-535.
12. Aujesky D, Obrosky DS, Stone RA, Auble TE, Perrier A, et al.: Derivation and validation of a prognostic model for pulmonary embolism. *Am J Respir Crit Care Med.* 2005; 172:1041-1046.
13. Ostovan MA, Ghaffari S, Pourafkari L, Dehghani P, Hajizadeh R, Nadiri M, Ghaffari MR. Modification of Simplified Pulmonary Embolism Severity Index and its Prognostic Value in Patients with Acute Pulmonary Embolism. *Heart Lung Circ.* 2016; 25(2):184-90.
14. Guyatt GH, Akl EA, Crowther M, Gutterman DD, Schünemann HJ. Executive summary: Antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based practice guidelines. *Chest* 2012;141(2 Suppl):7S-47S.
15. Jaff MR, McMurtry S, Archer SL, Cushman M, Goldenberg N, et al and on behalf of the American Heart Association Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation, Council on Peripheral Vascular Disease, and Council on Arteriosclerosis, Thrombosis and Vascular Biology. Management of Massive and Submassive Pulmonary Embolism, Iliofemoral Deep Vein Thrombosis, and Chronic Thromboembolic

Pulmonary Hypertension *Circulation*. 2011;123:1788-1830.

16. Meyer G, Vicaut E, Danays T, Agnelli G, Becattini C, et al. and on behalf of the PEITHO Investigators. Fibrinolysis for Patients with Intermediate-Risk Pulmonary Embolism. *N Engl J Med* 2014; 370:1402-1411.
17. Konstantinides S, Geibel A, Heusel G, Heinrich F, Kasper W. Heparin plus alteplase compared with heparin alone in patients with submassive pulmonary embolism. *N Engl J Med*. 2002;347:1143–1150.
18. Kucher N, Boekstegers P, Muller OJ, Kupatt C, Beyer-Westendorf, et al. Randomized, controlled trial of ultrasound-assisted catheter-directed thrombolysis for acute intermediate-risk pulmonary embolism. *Circulation*. 2014;129:479-86.

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