

A 70-Year-Old Man With Worsening Dyspnea After an Ankle Fracture



Vikramjit Mukherjee, MD; Gustavo Guandalini, MD; Bishoy Zakhary, MD; and Ezra Dweck, MD



CHEST 2017; 151(2):e25-e27

A 70-year-old man presented to the hospital after an ankle fracture sustained 3 weeks prior. He started having shortness of breath 3 days prior to admission along with intermittent dizziness. He did not have any significant past medical history. He denied chest pain, loss of consciousness, or any constitutional symptoms.

On presentation to the emergency room, the patient was alert and oriented. Peripheral pulses were present and capillary refill was normal. Physical examination revealed swelling and tenderness to palpation over the right ankle. The chest was clear to auscultation bilaterally. Cardiac examination revealed normal S1 and S2 sounds without murmurs, rubs, or gallops.

Neuromuscular examination of the lower extremities yielded unremarkable results.

Soon after admission, after initiation of unfractionated heparin, the patient developed dyspnea, diaphoresis, and sinus tachycardia along with hypoxia, hypotension, and an undetectable end-tidal partial pressure of carbon dioxide. Based on the clinical history and physical examination, a goal-directed ultrasound was performed (Video 1).

Question: Based on these videos, what is the most likely diagnosis?

AFFILIATIONS: From the New York University Medical Center, New York, NY.

CORRESPONDENCE TO: Vikramjit Mukherjee, MD, Medicine/Pulmonary and Critical Care Medicine, New York University Medical Center, Bellevue Hospital Center NBV -10W15, 462 First Ave, New York, NY 10016; e-mail: vikramjit.mukherjee@nyumc.org

Copyright © 2016 American College of Chest Physicians. Published by Elsevier Inc. All rights reserved.

DOI: <http://dx.doi.org/10.1016/j.chest.2016.05.042>

Answer: Right common femoral DVT with evidence of severe right ventricular dysfunction as well as clot in transit with hypotension consistent with a massive pulmonary embolism (PE).

Discussion

The patient had evidence of a right common femoral vein thrombus, massive PEs, and free-floating right heart thrombi (FFRHT). FFRHT are commonly underdiagnosed even though they occur in as many as 18% of patients with massive PE.¹ This underscores the important role of point-of-care echocardiography for risk stratification in patients presenting with clinical signs and symptoms of massive PE, as endorsed by the guidelines by the American Society of Echocardiography.²

This patient had several interesting findings on initial echocardiography. First, there was paradoxical septal motion due to right ventricular overload, which was best seen in the parasternal short-axis and apical four-chamber views. Second, the left ventricular cavity was small and its walls were hyperkinetic because of ventricular interdependence. Third, the right ventricle was severely hypokinetic and severely dilated with a positive McConnell's sign. Finally, there was a large, free-floating sausage-like mass entering the right atrium from the dilated inferior vena cava, which intermittently protruded through the tricuspid valve into the right ventricle. Based on these findings, the patient was diagnosed with a massive pulmonary embolism complicated by right ventricular failure along with a clot in transit.

The patient was immediately taken to the operating room for mechanical embolectomy. The right atrium was opened and a clot tracking from the auricle into the inferior vena cava was removed. A pulmonary artery arteriotomy was performed, and clots tracking through the left and right pulmonary artery were removed as well. As the patient was being weaned off of cardiopulmonary bypass, his mean arterial pressure fell despite inotropic support. A right ventricular assist device (RVAD) was placed. Postoperatively, the patient was gradually weaned off inotropic support and the RVAD was explanted on postoperative day 14. A follow-up echocardiogram demonstrated improvement in right ventricular function (Video 2). The patient was discharged to rehabilitation 1 month after admission to the hospital.

Right heart thrombi may be peripheral venous clots that accidentally lodge in the right heart en route to the lungs (type A) or may develop within the right heart chambers themselves (type B). Type A thrombi are typically worm shaped, extremely mobile, and often result in PE; type B thrombi, on the other hand, are broad based and less likely to migrate. In the context of this patient's recent ankle fracture with DVT, and the presence of a cavoatrial thrombus as well as massive PE, he most likely had a type A FFRHT.

The presence of FFRHT in PE predicts poor outcomes, with mortality rates ranging from 27% to 44%.^{3,4} Timely diagnosis is vital. The transthoracic echocardiogram (TTE) is a rapid, noninvasive, and sensitive modality for identifying right heart thrombi. The role of TTE in the workup of undifferentiated shock has been validated in multiple studies.⁵ This case supports a valuable role for real-time bedside ultrasonography and led to the prompt diagnosis of a potentially catastrophic disease process.

FFRHT is an extreme emergency. Delays in treatment are strongly associated with mortality: up to 20% of patients die within the first day of admission.⁶ Older age, presence of shock or severe hypoxemia, and conservative management using only heparin portend poorer prognosis. Treatment options must include either thrombolysis or surgical embolectomy with exploration of the right heart and pulmonary arteries under full cardiopulmonary bypass. Outcomes between these two approaches are comparable,⁵ although in the hemodynamically unstable patient, the latter approach may be preferred.⁷⁻⁹ Perioperative hemodynamic instability, as in this patient, is common, and patients should be treated in an intensive care unit with close attention to inotropic support and right ventricular function. Rarely, a right ventricular assist device may be used to bypass the failed right ventricle while awaiting dissolution or recanalization of the thrombotic burden.¹⁰

In summary, we present a case of an ankle fracture complicated by a right common femoral vein DVT leading to free-floating right heart thrombus and massive pulmonary embolism. Favorable outcomes were achieved because of rapid recognition based on the prompt use of bedside ultrasound, leading to urgent surgical embolectomy with a temporary right ventricular assist device.

Reverberations

1. *Bedside TTE is crucial in the rapid assessment of patients with undifferentiated shock, and, in this patient, led to*

a swift diagnosis of free-floating right heart thrombi with massive pulmonary embolism and right ventricular failure.

2. Early recognition and treatment with either thrombolytics or surgical embolectomy leads to improved outcomes in patients with FFRHT, and a surgical approach may be preferred for this group of patients.
3. Postoperative instability is common in patients with FFRHT, and the right ventricle may need inotropic or mechanical circulatory support as the clot burden decreases with time.

Acknowledgments

Financial/nonfinancial disclosures: None declared.

Other contributions: The authors acknowledge the assistance of Deane Smith, MD, Cecilia Mirante-Borde, MD, and Manish Kumar, MD. CHEST worked with the authors to ensure that the Journal policies on patient consent to report information were met.

Additional information: To analyze this case with the videos, see the online version of this article.

References

1. Torbicki A, Galié N, Covezzoli A, Rossi E, De Rosa M, Goldhaber SZ. Right heart thrombi in pulmonary embolism: results from the International Cooperative Pulmonary Embolism Registry. *J Am Coll Cardiol*. 2003;41(12):2245-2251.
2. Saric M, Armour AC, Arnaout MS, et al. Guidelines for the use of echocardiography in the evaluation of a cardiac source of embolism. *J Am Soc Echocardiogr*. 2016;29(1):1-42.
3. Rose PS, Punjabi NM, Pearse DB. Treatment of right heart thromboemboli. *Chest*. 2002;121(3):806-814.
4. De Vrey EA, Bax JJ, Poldermans D. Mobile right heart thrombus and massive pulmonary embolism. *Eur J Echocardiogr*. 2007;8(3):229-231.
5. Beaulieu Y. Bedside echocardiography in the assessment of the critically ill. *Crit Care Med*. 2007;35(5 suppl):S235-S249.
6. Chartier L, Béra J, Delomez M, et al. Free-floating thrombi in the right heart: diagnosis, management, and prognostic indexes in 38 consecutive patients. *Circulation*. 1999;99(21):2779-2783.
7. Leacche M, Unic D, Goldhaber SZ, et al. Modern surgical treatment of massive pulmonary embolism: results in 47 consecutive patients after rapid diagnosis and aggressive surgical approach. *J Thorac Cardiovasc Surg*. 2005;129(5):1018-1023.
8. Azari A, Beheshti AT, Moravvej Z, Bigdelu L, Salehi M. Surgical embolectomy versus thrombolytic therapy in the management of acute massive pulmonary embolism: short and long-term prognosis. *Heart Lung*. 2015;44(4):335-339.
9. Cho YH, Sung K, Kim WS, et al. Management of acute massive pulmonary embolism: is surgical embolectomy inferior to thrombolysis? *Int J Cardiol*. 2016;203:579-583.
10. Geller BJ, Morrow DA, Sobieszczyk P. Percutaneous right ventricular assist device for massive pulmonary embolism. *Circ Cardiovasc Interv*. 2012;5(6):e74-e75.