

Development of massive pulmonary embolism during echocardiographic imaging

A case report

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Abstract

Rationale: Pulmonary embolism (PE) is a common diagnostic consideration for patients who present to the emergency department (ED) with chest pain, dyspnea, or both. In addition, PE has a very high mortality in patients who are hemodynamically unstable. An electrocardiography, bedside transthoracic echocardiogram, and computed tomography pulmonary angiogram are usually performed to confirm the diagnosis.

Patient concerns: A 53-year-old man was admitted to the cardiology clinic with complaints of dyspnea, chest pain, and general weakness after walking. He had a history of hypertension and smoking.

Diagnosis: During synchronous recording of echocardiographic images, a large mobile thrombus detached from the right atrium, and first embolized to the right ventricle and then to the main pulmonary artery from the right heart chambers. Soon after, shortness of breath developed which clinically worsened the patient. Transthoracic echocardiogram which demonstrated the thrombus in the pulmonary artery or right heart chambers was suspected of causing acute massive PE.

Interventions: The patient was transferred to Critical Care Unit for monitoring; 100 mg of alteplase was initiated immediately and alleviated the hemodynamic instability within 2 hours of intravenous administration.

Outcomes: To the best of our knowledge, this is the first synchronous echocardiographic recording showing the embolization of a thrombus from the right atrium, first to the right ventricle and then to the main pulmonary artery.

Lessons: Transthoracic echocardiography provides a safe, rapid, and noninvasive diagnostic tool for evaluation of suspected massive PE. Thrombolytic therapy is useful for treating acute massive PE that leads to hemodynamic instability.

Abbreviations: BP = blood pressure, ECG = electrocardiography, ED = emergency department, LV = left ventricle, PE = pulmonary embolism, r-tPA = recombinant tissue plasminogen activator, RV = right ventricle, TTE = transthoracic echocardiogram.

Keywords: acute pulmonary embolism, fibrinolytic therapy, transthoracic echocardiography

1. Introduction

Pulmonary embolism (PE) is a common diagnostic consideration for patients who are admitted to EDs with chest pain, dyspnea, or both.^[1] In addition, PE has very high mortality in patients who are hemodynamically unstable.

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An electrocardiography (ECG), bedside transthoracic echocardiogram (TTE), and computed tomography pulmonary angiogram are performed to confirm the diagnosis of PE.^[2] Transthoracic echocardiography rarely confirms the diagnosis of pulmonary embolism visualizing a thrombus in the pulmonary artery or right heart chambers.^[3]

Prompt diagnosis and appropriate therapy for unstable patients may reduce the mortality of massive PE. Thrombolytic therapy is very useful in treating acute massive PE.^[4,5] This case report is about synchronous recording of embolization of thrombus.

2. Case presentation

A 53-year-old man with a history of hypertension and smoking was admitted to cardiology clinic with complaints of dyspnea, chest pain, and general weakness after walking. At admission, his blood pressure (BP) was 100/60 mm Hg, the pulse rate was 90/min, and the respiratory rate was 20/min. ECG showed sinus tachycardia with heart rate of 100 beats/min.

The TTE demonstrated a normal left ventricle (LV) function, whereas the right ventricle (RV) appeared markedly dilated and hypokinetic. There was leftward displacement of the interventricular septum, increased systolic pulmonary arterial pressure (85 mm Hg) and a big mass was floating in



Figure 1. Chest computed tomography showing massive bilateral pulmonary embolism.

the right atrium, protruding through the tricuspid valve into the RV in diastole.

During echocardiographic imaging, a large mobile thrombus which was attached to the free wall of the right atrium detached and was embolized to the pulmonary (Video 1, <http://links.lww.com/MD/C192>). Thereafter, shortness of breath developed and the patient's clinic was worsened. Presenting vital signs were as follows: BP 85/60 mm Hg, heart rate 110 beats/min, respiratory rate 24 breaths/min, and SpO₂ 85%. On cardiac examination, the patient was tachycardic, the heart rate was rhythmic, and the lungs were clean. Due to severe hemodynamic instability, the patient was transferred to Critical Care Unit for monitoring, and 100 mg alteplase was administered via intravenous infusion in 2 hours. Upon completion of the infusion, the BP was 110/70 mm Hg, heart rate 90 beats/min, and oxygen saturation remained at 90% on 3 to 4L/min of oxygen. An intravenous unfractionated heparin (5000 unit bolus; 1000 unit/h) was started. Formal transthoracic echocardiography revealed mild RV dilatation with moderately depressed RV systolic function, and normal LV function with an LV ejection fraction of 65%. Pulmonary artery systolic pressure was estimated to be 48 mm Hg. During the hospitalization period, chest computed tomography was obtained and confirmed diagnosis of massive bilateral pulmonary embolism (Fig. 1). Venous duplex ultrasound of the lower extremities scans was found to be normal. The patient was discharged after 5 days of hospitalization. Ethics committee approval was not necessary because the case presentation was a retrospective study. The patient was informed of his situation and a signed consent form was obtained.

3. Discussion

The patient had risk factors for venous thromboembolism including hypertension and smoking,¹⁴¹ and no physical signs of deep vein thrombosis. Transthoracic echocardiography rarely confirms a diagnosis of pulmonary embolism by visualizing a

thrombus in the pulmonary artery or right heart chambers.^{13,61} In the presence of hemodynamic instability, thrombus in the pulmonary artery or right heart chambers should evoke suspicion of massive PE enabling a prompt diagnosis and appropriate treatment.

Our patient had markedly dilated and hypokinetic RV with leftward displacement of the interventricular septum, and increased systolic pulmonary arterial pressure (85 mm Hg). During echocardiographic imaging, a big mass floating in the right atrium and protruding through the tricuspid valve into the right ventricle in diastole was embolized to the pulmonary artery, and the event was recorded in a synchronous manner.

Thrombolytic therapy is very useful for treating the acute massive PE which is a cause of hemodynamic instability.¹⁵¹ Thrombolytic therapy with 100mg of r-tPA administered in 2 hours via intravenous administration is recommended in patients with persistent hypotension due to massive PE or recurrent PE, despite anticoagulation (class I, level B).¹⁷¹ In this case alteplase, which was initiated immediately and administered intravenously in 2 hours, alleviated the hemodynamic instability.

4. Conclusions

To the best of our knowledge, this is the first synchronous echocardiographic recording showing the embolization of a thrombus from right atrium, first to the RV and then to the main pulmonary artery. Transthoracic echocardiography provides a safe, rapid, and noninvasive diagnostic tool for evaluation of suspected massive PE in many clinical scenarios. Thrombolytic therapy is useful for treating acute massive PE that causes patient's hemodynamic instability.

Author contributions

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References

- [1] Borloz MP, Frohna WJ, Phillips CA, et al. Emergency department focused bedside echocardiography in massive pulmonary embolism. *J Emerg Med* 2011;41:658–60.
- [2] Petrov DB. Appearance of right bundle branch block in electrocardiograms of patients with pulmonary embolism as a marker for obstruction of the main pulmonary trunk. *J Electrocardiol* 2001;34:185–8.
- [3] Echocardiography in pulmonary embolism *Arch Mal Coeur Vaiss.* 1995; 88(11 suppl):1715–1722.
- [4] Konstantinides SV, Torbicki A, Agnelli G, et al. 2014 ESC guidelines on the diagnosis and management of acute pulmonary embolism. *Eur Heart J* 2014;35:3033–69.
- [5] Stein PD, Matta F. Thrombolytic therapy in unstable patients with acute pulmonary embolism. *Am J Med* 2012;125:465–70.
- [6] Zhan ZQ, Wang CQ, Nikus KC, et al. Electrocardiogram patterns during hemodynamic instability in patients with acute pulmonary embolism. *Ann Noninvasive Electrocardiol* 2014;19:543–51.
- [7] Yua HH, Jengb JR. Pulseless electrical activity in acute massive pulmonary embolism during thrombolytic therapy. *Tzu Chi Med J* 2017;29:50–4.