Case Report

Large thrombus-in-transit within a patent foramen ovale in a patient with pulmonary embolism: a case report

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Abstract

Objective: A patent foramen ovale (PFO) is detected frequently by echocardiography. However, a thrombus trapped in a PFO is relatively rare. We herein describe a rare case of a 51-year-old patient with pulmonary embolism in which a large thrombus-in-transit through a PFO was found by echocardiography and disappeared after treatment.

Methods: A 51-year-old woman presented with a 1-week history of chest tightness, unspecified chest pain, and shortness of breath. Echocardiography revealed a large thrombus trapped in a PFO with increased pulmonary artery pressure, which is a very rare and critical condition.

Results: The patient was treated with thrombolysis and anticoagulation and discharged from the hospital with an uneventful recovery.

Conclusion: Our treatment of the present patient achieved a satisfactory result, but it may not be applicable to every patient. Echocardiography is a readily available and safe tool for demonstrating the size, location, and extent of a thrombus, and it plays an important role in the early diagnosis and treatment evaluation for patients with a thrombus trapped in a PFO with concurrent pulmonary embolism.

Keywords

Thrombus-in-transit, patent foramen ovale, pulmonary embolism, echocardiography, pulmonary artery pressure, thrombolysis, anticoagulation

Date received: 28 March 2018; accepted: 28 June 2018

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Introduction

Thrombus-in-transit is a rare and critical condition. The mortality rate among patients with a transitional thrombus with pulmonary embolism (PE) is very high because PE-induced pulmonary hypertension facilitates passage of the transitional thrombus through a patent foramen ovale (PFO), thereby increasing the incidence of paradoxical embolism and even sudden death. The treatment of a transitional thrombus in patients with PE is controversial. Surgical embolectomy has shown a trend toward improved survival, but the postoperative mortality rate is high. We herein describe a rare case involving a 51-year-old patient with a large thrombus entrapped in a PFO and extensive bilateral PE. The patient underwent thrombolytic and anticoagulation therapy. After 25 days, she was discharged from the hospital with an uneventful recovery. This case is being reported to illustrate that thrombolytic and anticoagulant therapy can be used as an alternative treatment in this condition.

Case report

A 51-year-old woman was transferred to our hospital with a 1-week history of chest tightness, unspecified chest pain, and shortness of breath. She also described a 10-day history of lower extremity pain. The patient had experienced no systemic embolic events or neurologic dysfunction. Initial physical examination revealed a blood pressure of 135/75 mmHg, pulse rate of 96 bpm, and respiratory rate of 25 breaths per minute. On cardiac examination, she had normal heart sounds with regular rhythm, and no murmurs were heard. Auscultation of the lungs revealed reduced breath sounds on both sides. Pulmonary computed tomography angiography demonstrated extensive bilateral PE including the segmental arteries (Figure 1). Except for a high serum D-dimer level of 5880.00 ng/mL, all laboratory test results were normal. Lower extremity vascular ultrasound showed bilateral posterior tibial vein thrombosis. Transthoracic echocardiography (TTE) demonstrated a large serpentine, free-floating echogenic mass of $9 \times 2$ cm in the right atrium and extending to the left atrium through a PFO (Figure 2); part of the mass moved to the left ventricle during diastole (Figure 3). The right heart cavities were dilated, and moderate right ventricular dysfunction was present. No emboli were visible in the central pulmonary artery. The systolic pulmonary artery pressure was 60 mmHg. Based on the TTE findings, we decided to perform transesophageal echocardiography (TEE). However, the patient had an esophageal diverticulum; therefore, TEE was not carried out.

The patient was hemodynamically stable. However, she reported that her chest tightness and shortness of breath had worsened after completion of the TTE examination. After a discussion with the patient and her family and surgeons, the patient underwent thrombolytic and anticoagulant therapy. Recombinant tissue plasminogen activator was intravenously administered (50 mg the first day), and heparin was administered by a continuous pump from 24 to 48 hours. This was followed by subcutaneous injection of low-molecular-weight heparin and oral warfarin for 3 days, and the oral warfarin was sustained thereafter. After 25 days of treatment, the serum D-dimer level had decreased to normal. Pulmonary computed tomography angiography showed that the PE had disappeared (Figure 4(a)). Follow-up TTE revealed no thrombus in the heart cavities (Figure 4(b)). The right heart cavities had recovered to normal size. The pulmonary artery systolic pressure decreased to 25 mmHg. No left-to-right shunt was present through the foramen
Figure 1. Pulmonary computed tomography angiography demonstrated extensive bilateral pulmonary embolism, including the segmental arteries (marked by white arrows).

Figure 2. Echocardiography (parasternal four-chamber view) showed a large thrombus entrapped in the patent foramen ovale (T: thrombus, RA: right atrium, LA: left atrium, RV: right ventricle, LV: left ventricle, MV: mitral valve, PFO: patent foramen ovale).
ovale. The patient was discharged from the hospital with an uneventful recovery.

The study protocol was approved by the institutional review board and ethics committee of the Qingdao University Medical School, Qingdao, China. Written informed consent was obtained from the patient.

**Discussion**

A large thrombus trapped in a PFO is a very rare finding.1–6 In the present case, the large thrombus trapped in the PFO was mostly a presumptive diagnosis by TTE. For clearer images in such cases,
TEE should be performed. However, the patient had an esophageal diverticulum and could not be examined by TEE.

The foramen ovale is a remnant from the embryonic period and acts as a potential door capable of opening from the right to left atrium. The foramen ovale is closes at 5 to 7 months after birth because of fusion of the first and second atrial septa. However, in up to 25% to 34% of normal adults, the foramen ovale is not completely fused and forms a potential space or separation between the septum primum and secundum located in the anterosuperior portion of the atrial septum; this is termed a PFO. Under normal conditions, because the pressure of the left atrium is higher than the right, there may no left-to-right shunt through the atrial septum. However, the interatrial pressure gradient can be reversed, which can occur in the setting of pulmonary hypertension induced by coughing, laughing, and the Valsalva maneuver. It can also occur in patients with pulmonary arterial hypertension secondary to PE and congenital heart disease. Once the pressure of the right exceeds that of the left, the foramen ovale may open from the right to left atrium. A thrombus from the venous system into the right atrium may easily cross into the left through a PFO.

In previous studies, the mortality rate associated with a paradoxical embolism secondary to a thrombus-in-transit was 18%, and 66% of patients died within 24 hours. Considering the high mortality of a thrombus-in-transit, early diagnosis and treatment is vitally important. Echocardiography may not only clearly identify the location and size of emboli, but it may also be helpful for making prompt management decisions.

To our knowledge, the treatments of choice in such cases include embolectomy, thrombolysis, or anticoagulation; however, the best management is still controversial. Anticoagulation and thrombolysis therapy seem to be hazardous in patients with a large thrombus-in-transit within a PFO because of the high risk of either fragmentation or complete embolization. However, Rose et al. reviewed many such cases during a 34-year period and showed that the mortality rate was lower after thrombolytic therapy than surgery. Our patient was hemodynamically stable, but she reported that her chest tightness and shortness of breath were worsening. In addition, the patient’s PE showed extensive bilateral involvement, including the segmental arteries. Moreover, lower extremity vascular ultrasound showed bilateral posterior tibial vein thrombosis. Therefore, we chose thrombolytic and anticoagulation treatment, and the patient achieved a good curative effect.

**Conclusion**

We have herein described an extremely rare case of a large thrombus-in-transit within a PFO in a patient with PE. We used thrombolytic and anticoagulation therapy to treat the patient and achieved complete resolution of the thrombus and the embolism. However, this treatment may not be applicable to every patient because of considerations regarding age and comorbidities. In addition to TEE, TTE is very helpful to identify at-risk patients and to make early management decisions. Echocardiography may give valuable information regarding the response to anticoagulation during the follow-up process. The present case also reminds us that the absence of a left-to-right shunt does not exclude the presence of a PFO.

**Declaration of conflicting interest**

The authors declare that there is no conflict of interest.
**Funding**

This research received no specific grant from any funding agency in the public, commercial, or not for-profit sectors.

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