

Right heart thrombus entrapped in patent foramen ovale with pulmonary embolism in a patient with primary hypercoagulable state

Primer aşırı pıhtılaşma eğilimi olan hastada foramen ovale'ye tuzaklanmış sağ kalp trombüsü ve pulmoner emboli

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ABSTRACT

Thromboembolic disease is a potentially severe pathology. When its clinical feature implies a massive occlusion of the arterial pulmonary tree and a cardiac failure is ensued, it can be seriously life threatening even for young patients. Less frequent features as right or left atrium thrombosis could increase morbidity and mortality of this disease.

We report a case of massive right pulmonary embolism (PE) with entrapped thrombus in patent foramen ovale and right heart failure in a 32-year-old man. Transthoracic echocardiography showed a right atrial thrombus attached to the inter-atrial septum. Following the diagnosis of right heart thrombosis with massive PE, infusion of tissue type plasminogen activator (100 mg in two hours) was administered. Echocardiography performed two days after thrombolysis showed a significant decrease in the right ventricular size and complete lysis of the thrombus in the right heart. By genetic examination, he proved to have factor V 'Leiden' gene and two thrombophilia genes, all of which were positive in the heterozygous state. He had also a high serum homocysteine.

Key words: pulmonary embolism, hypercoagulable state, thrombolytic therapy, patent foramen ovale

INTRODUCTION

The right atrium is a common localization for the cardiac masses. Both transthoracic and transesophageal echocardiography, is the standard tool in the evaluation of these masses. The elongated Eustachian valve or the Chiari network account for the

ÖZET

Tromboembolik hastalık erken tanı konulmadığında hayatı tehdit eden ciddi bir patolojidir. Pulmoner arterde masif oklüzyon oluşturduğunda, kalp yetmezliği de gelişmişse genç insanlarda bile ölüme neden olabilir. Sağ veya sol atriyumda trombüs olması ise bu hastalığın morbidite ve mortalitesinde artışa sebep olur.

Bu yazıda patent foramen ovalenin tuzakladığı trombüsü olan, masif pulmoner tromboemboli ve sağ kalp yetmezliği gelişen 32 yaşında bir erkek olgu sunulmuştur. Transtoraksal ekokardiyografide interatriyal septuma yapışık sağ atriyal trombüsü olan hastaya masif pulmoner tromboemboli tanısı konulduktan sonra doku plazminojen aktivatörü (2 saatte 100 mg) infüzyonu uygulandı. Tedaviden 2 gün sonra yapılan ekokardiyografide sağ atriyumdaki trombüsün tamamen kaybolduğu ve sağ ventrikül boyutlarında küçülme olduğu görüldü. Yapılan genetik incelemede, faktör V Leiden ve trombofil gen mutasyonu saptandı. Hastanın serum homosistein seviyeleri yüksek bulundu.

Anahtar kelimeler: Pulmoner emboli, pıhtılaşma bozukluğu, trombolitik tedavi, patent foramen ovale

majority of these, but thrombus or tumors are also common.¹

A patent foramen ovale (PFO) is a remnant of the fetal circulation and persists in 25% to 35% of healthy subjects. PFO is responsible for many embolisms, particularly the cryptogenic stroke. Para-

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doxic embolism, direct embolism, accompanying atrial arrhythmias, hypercoagulable states are implicated mechanisms in embolisms caused by the PFO.² In case of venous thromboembolism and pulmonary embolism (PE), elevated right-heart filling pressures, in the presence of a PFO, may lead to potentially fatal hypoxemia and may cause paradoxical embolism to the arterial side.³ Therefore, the presence of a PFO is an independent predictor of adverse outcome in patients with PE.⁴

In previous studies, a homocysteine-mediated oxidant stress has been shown to trigger platelet activation, lead to a tendency to thrombosis, in patients with severe hyperhomocysteinemia.⁵ Moreover, factor V Leiden and thrombophilia gene mutations contribute to the development of thrombi.⁶

CASE REPORT

A 32 year old male patient admitted to a clinic with symptoms of sudden onset of dyspnea, pleuritic chest pain, hemoptysis and syncope. The patient was referred to our clinic because of a mobile mass image in the right atrium (RA) in the transthoracic echocardiography (TTE).

In our emergency service, he was conscious and cooperative. Blood pressure was 80/50 mmHg, pulse was 104 beats/min, respiration rate was 30/min. Cardiac auscultation revealed a 3/6 grade systolic murmur at the mesocardiac localization. Respiratory sounds were decreased at the bases of the lungs in the respiratory system examination. The other physical examination findings were all normal. Leukocytosis ($18100/\text{mm}^3$, reference value: $4,8-10,8 \times 10^3/\text{mm}^3$), increased C-reactive protein (4,05 mg/dl, reference value: 0,0-0,5 mg/dl), D-dimer (3,81 mg/L, reference value: 0,0-0,55 mg/L) and troponin-T (0,357 ng/ml, reference value: 0,0-0,1 ng/ml) levels were detected in the laboratory examination. A mild hypoxemia and a respiratory alkalosis state were detected in arterial blood gas analysis (pH: 7,45 pO_2 : 54,5 mmHg, pCO_2 : 20.6 mmHg SaO_2 : 84%, cHCO_3 : 14.2 mmol/L). Electrocardiography showed sinus tachycardia, T wave inversions on precordial derivations and an S1Q3T3 pattern (figure 1). The left ventricle ejection fraction was 65%, the estimated systolic pulmonary artery pressure was 65 mmHg and there was a moderate degree tricuspid regurgi-

tation with dilatation of right cardiac chambers on the TTE examination. Besides these findings, in the RA there was an 22x19 mm sized mass image compatible with thrombus which is attached to interatrial septum (Figure 2a). There was a flow from RA to left atrium (LA) on color Doppler examination (Figure 2b). Because of high probability of pulmonary thromboembolism, computerized tomography (CT) angiography was initially thought to be performed, but because of technical problems we could not perform CT angiography. Perfusion scintigraphy performed with pre - diagnosis of pulmonary embolism, and a perfusion defect was detected at the left lung (Figure 3). The patient was hospitalized in the coronary care unit and thrombolytic treatment was given to the patient. Intravenous tissue plasminogen activator (t-PA) with 100 mg dose was given in 2 hours and intravenous unfractionated heparin (UFH) with a dose of 1300 units/hour was given subsequently. During the following 4 days, intravenous UFH treatment was given to patient with activated partial thromboplastin time levels to be 2 times the normal. The 2 days after the thrombolytic treatment, on TTE examination, the estimated systolic pulmonary artery pressure was declined, the RA thrombus was disappeared and flow from RA to LA was also lost on color Doppler examination (figure 2c and 2d). For the exact diagnosis of the PFO, a TEE was performed to patient with agitated saline infusion. There was a saline contrast passage from RA to LA. Because of the probability of a hypercoagulable state presence in patient, left atrial appendix (LAA) is also visualized in TEE examination and another thrombus in LAA was seen (Figure 4). Images compatible with deep venous thrombosis sequella was detected in bilateral superficial femoral and deep femoral vein in lower extremity venous doppler examination. The patient was homozygous for the Factor V Leiden mutation (G1691A), and heterozygous for the methylene tetrahydrofolate reductase (MTHFR) (C677T) in the genetic examination. He had also serum homocysteine level of 64.3 $\mu\text{mol/L}$.

On the 4th day of hospitalization, enoxsarin and warfarin treatment were initiated. Enoxsarin was stopped when the international normalized ratio reached the therapeutic levels. The patient was discharged after 10 days of hospitalization.

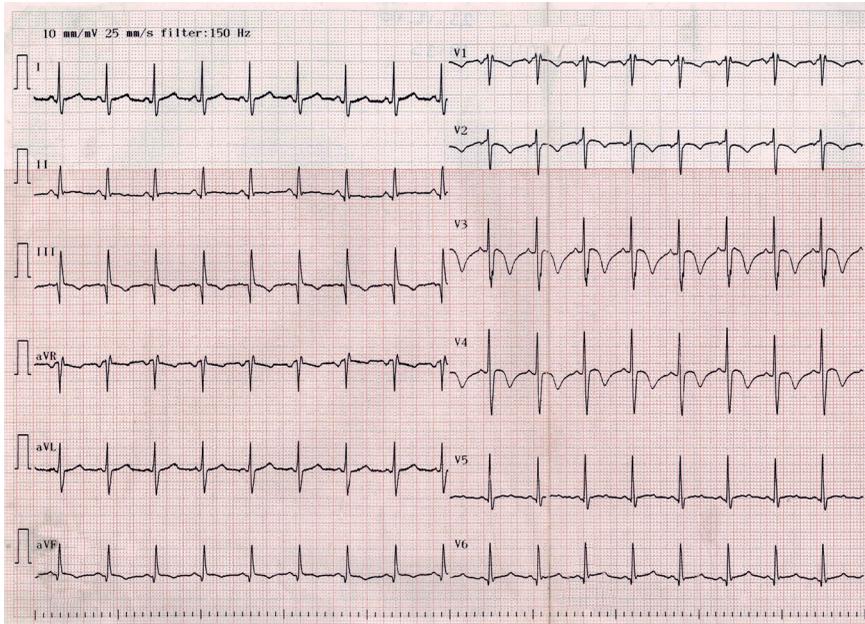


Figure 1. Electrocardiogram showed sinus tachycardia and an S1Q3T3 pattern

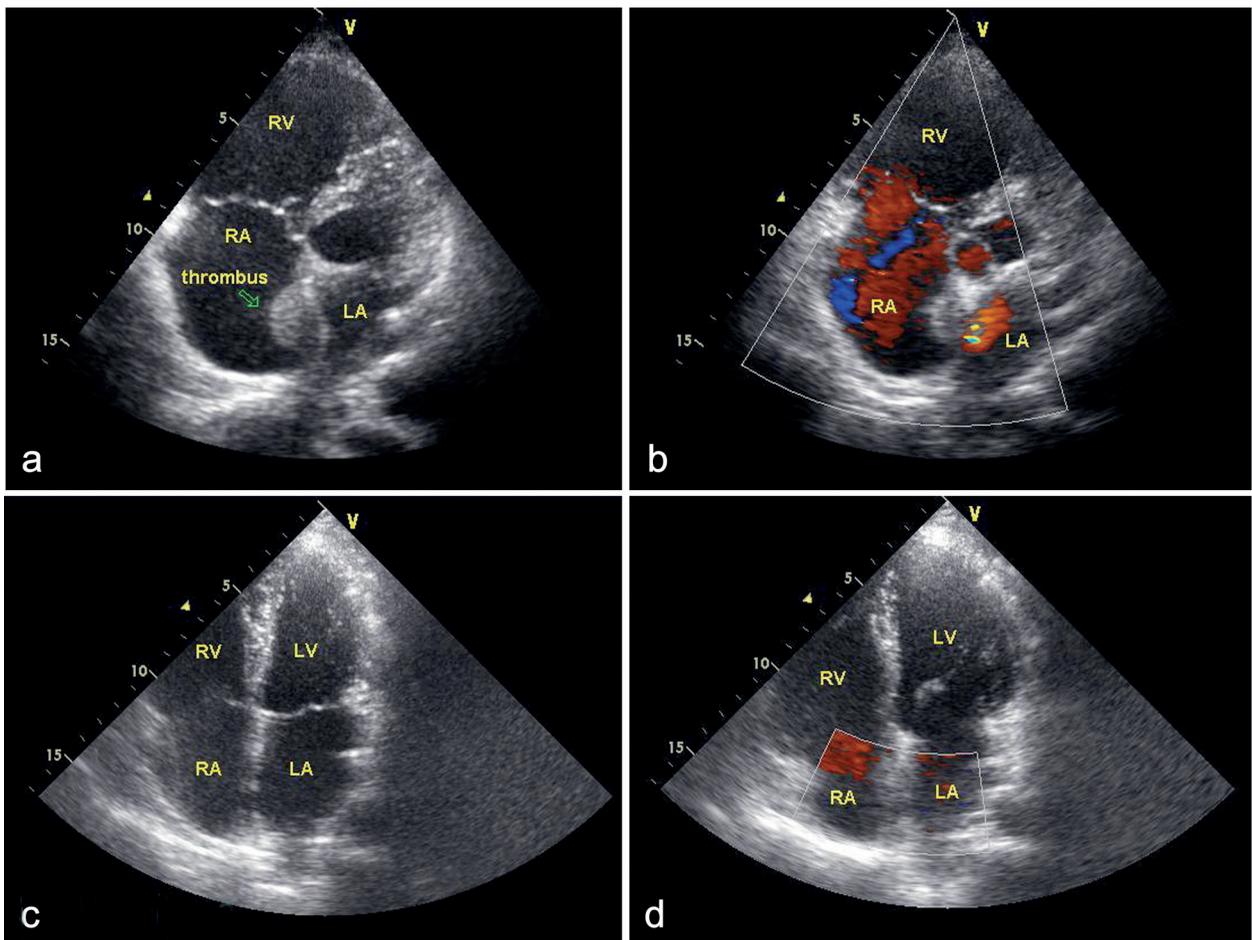


Figure 2. a-b) 2D echocardiographic appearance of right atrial thrombus and colour Doppler echocardiographic appearance of passage of blood from right atrium to left atrium before thrombolytic treatment (RA: Right atrium, RV: Right ventricle, LA: Left atrium). **c-d)** Disappearance of thrombus and blood flow from right atrium to left atrium with colour Doppler after thrombolytic treatment (RA: Right atrium, RV: Right ventricle, LA: Left atrium, LV: Left ventricle).

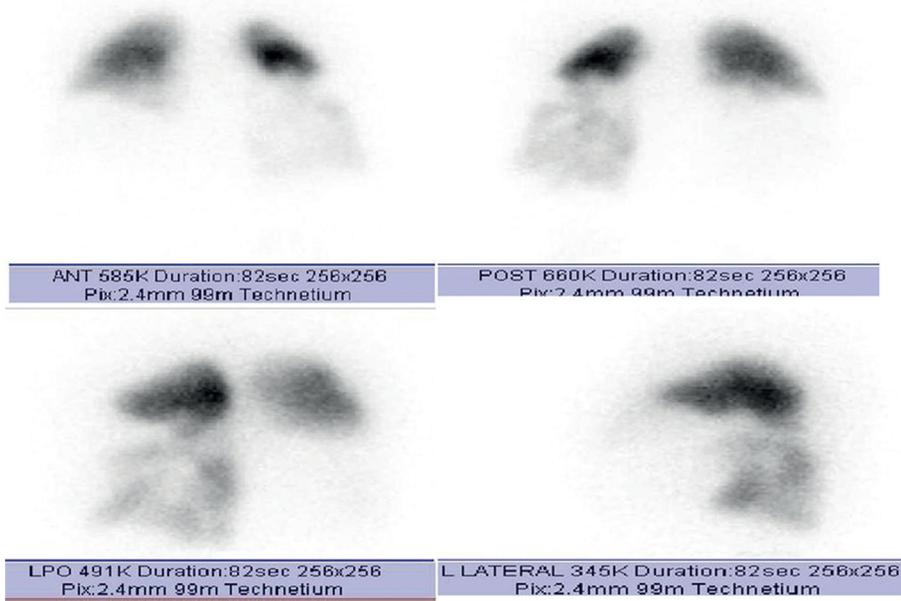


Figure 3. Appearance of left lung perfusion defect at the perfusion lung scintigraphy.

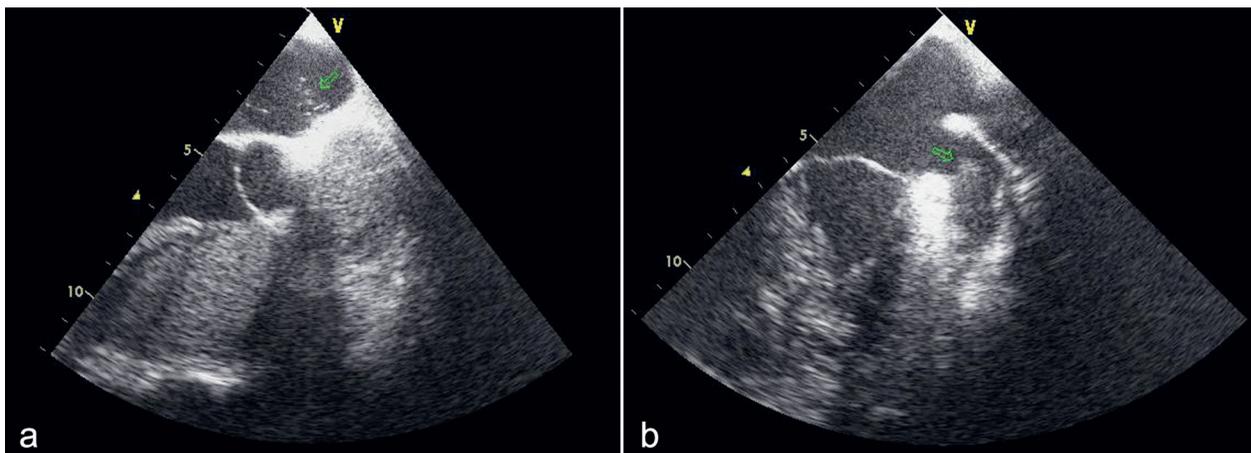


Figure 4. **a)** 2D contrast transoesophageal echocardiographic appearance of saline microbubbles flow from right atrium to left atrium (indicated with green arrow). **b)** 2D transoesophageal echocardiographic appearance of left atrial appendix thrombus (indicated with green arrow).

DISCUSSION

Patent foramen ovale is responsible for many embolisms, particularly the cryptogenic stroke. Stasis has an important role in direct embolisms caused by the PFO. Anatomic structure of the PFO and the lower pressure gradient between the two atria leads to stasis. Moreover there is a procoagulant environment in the PFO tunnel. All of these factors may lead to the development of thrombus in the PFO and direct embolism. Accordingly individuals with a PFO have a natural source of embolism.² In our patient there is also a hypercoagulable situation which in turn increases this risk.

Right atrial thrombus entrapped in a PFO is a rare situation. It is generally associated with PE or paradoxical embolism. It is usually regarded as an imminent paradoxical embolus because of its high potential to result in systemic embolism. In most of the cases PE accompanies the paradoxical embolism. Usually, paradoxical embolism follows PE, because elevated right-side pressures enhance right-to-left shunting through a PFO.⁷ Cranial magnetic resonance imaging was not considered for investigation in our case, because our patient had neither symptoms, nor findings of systemic embolisms at the time of admission and during follow up.

Beside echocardiographic assessment is a very important tool in the emergency diagnosis of acute PE. It can reveal not only signs of right heart overload, but it can also rarely indicate a thrombus in the right cardiac chambers or in the PA. Serial echocardiographic evaluation is valuable in subsequent follow-up and to confirm the response to treatment. TEE can further confirm the nature of the thrombus, describe its relation to the interatrial septum.⁶ In patients with high probability of PE, CT angiography should be performed urgently. Especially in unstable patients, if the CT and any other diagnostic tests could not be performed, echocardiography is recommended to detect the right ventricle overload which can be a sufficient diagnostic clue to start urgent PE treatment.^{8,9} We could not perform CT angiography because of technical problems in CT, and thrombolytic treatment decision was made with the echocardiographic findings and urgent perfusion scintigraphy result.

There are several therapeutic options for right heart thromboembolisms. These are anticoagulation therapy, thrombolytic therapy, and surgical removal of the thrombus. Each of these has its own advantages and disadvantages, and the optimal means of treatment is yet unclear. Even the anticoagulant or thrombolytic therapy are cost-effective and easily available options, they may result in fragmentation and further embolization of the thrombus. Surgery has an advantage of providing a chance to close the PFO, thereby preventing recurrent paradoxical embolism. Treatment delays and the risks of cardiopulmonary bypass are the disadvantages of surgery. In a previous report, in 49 patients who had thromboemboli entrapped in right heart chambers, the mortality rate was 50% with medical therapy and 15% with surgery.¹⁰ However, in a review of 177 cases of right heart thromboemboli, the mortality rate of patients undergoing anticoagulation was comparable to that of surgery. The thrombolysis group had the lowest mortality rate whereas the mortality rate in an untreated group was 100%.¹¹

Because of impaired hemodynamics, the thrombolytic treatment was given to our patient. Because of the patient has a hypercoagulable state, the possible procoagulant effect of the patch which is using for the repairment of the PFO, the early surgical in-

tervention to close the PFO and resect the thrombus in the LAA was not planned for the patient. Anticoagulant therapy with warfarin was planned for the patient. In the follow up visits if systemic embolism occurs, surgical intervention to close the PFO and resect the thrombus in the LAA was planned.

In conclusion, the treatment of thrombus entrapped in a PFO presenting with acute PE remains a challenge for physicians. Moreover primary hypercoagulable states should be investigated in these patients.

Conflict of interest: non-declared.

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