Thrombus-in-transit entrapped in a patent foramen ovale: a complication of brucellosis

Foramen ovale açıklığında geçiş yaparken sıkışan trombüs: Bir bruselloz komplikasyonu

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Summary – Brucella infection may cause vascular complications such as deep venous thromboembolism. This is the first report on an entrapped thrombus in a patent foramen ovale (PFO) in a patient with Brucella infection. A 43-year-old woman was admitted with complaints of fever, dyspnea, malaise, myalgia, and pretibial edema. Clinical and laboratory findings were consistent with brucellosis. Transthoracic echocardiography demonstrated a mobile, hyperechoic worm-like thrombus entrapped in a PFO. Right ventricular enlargement and elevated systolic pulmonary artery pressure (77 mmHg) showed acute pulmonary embolism. Multidetector computed tomography revealed a huge thrombus, 11.7 cm in length, in the bifurcation of the main pulmonary artery. Considering the huge size of the right heart thrombus and hemodynamically significant acute pulmonary embolism, open heart surgery was performed, during which an 11-cm thrombus was found extending from the right atrium across the PFO into the left atrium. The interatrial septum was excised *en bloc* together with the thrombotic mass and the PFO was closed. Pulmonary thromboendarterectomy was also performed. After surgery, systolic pulmonary artery pressure decreased to 38 mmHg and the patient was discharged without complications.

Özet – Brusella enfeksiyonu derin ven trombozu gibi vasküler komplikasyonlara neden olabilir. Bu olgu sunumunda, brusella enfeksiyonu olan bir hastada foramen ovale açıklığına (FOA) sıkışan trombüs ilk kez olarak bildirilmektedir. Kırk üç yaşında kadın hasta ateş, nefes darlığı, halsizlik, kas ağrısı ve pretibial ödem yakınmalarıyla yatırıldı. Klinik ve laboratuvar bulguları brusella enfeksiyonu ile uyumluydu. Transtorasik ekokardiyografide FOA'da sıkışmış durumda, hareketli, hiperekoik, solucan sekilli bir trombüs görüldü. Sağ ventrikül genişlemesi ve yükselmiş sistolik pulmoner arter basıncı (77 mmHg) akut pulmoner emboliye işaret etmekteydi. Multidetektör bilgisayarlı tomografide de ana pulmoner arter çatallanmasında 11.7 cm uzunluğunda dev bir trombüs izlendi. Sağ kalp trombüsünün boyutu ve hemodinamik açıdan önemli akut pulmoner emboli varlığı göz önüne alınarak, hastaya açık kalp ameliyatı uygulandı. Ameliyatta sağ atriyumdan FOA aracılığıyla sol atriyuma geçen 11 cm uzunluğunda trombüs görüldü. İnteratriyal septum blok halinde trombotik materyal ile beraber kesilip çıkartıldı, FOA kapatıldı ve pulmoner tromboendarterektomi yapıldı. Ameliyattan sonra hastanın sistolik pulmoner arter basıncı 38 mmHg'ye düştü ve hasta sorunsuz taburcu edildi.

Brucella infection may cause various complications including vascular complications such as deep venous thromboembolism. Patent foramen ovale is the most common conduit where an embolus from the venous system may be entrapped causing paradoxical embolism. The presence of PFO in acute pulmonary embolism is associated with significantly higher incidences of death and embolic complications. In this case report, we describe a patient in whom DVT caused by brucella infection was responsible for thrombus-in-transit entrapped in the PFO and also pulmonary embolism.

Abbreviations:

DVT *Deep venous thromboembolism*
PFO *Patent foramen ovale*

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CASE REPORT

A 43-year-old female patient with an unremarkable past medical history was admitted to our hospital with a 15-day history of fever, progressive dyspnea, malaise, myalgia, and pretibial edema. She came from an endemic area of brucella infection and reported frequent ingestion of raw sheep milk. She had no other predisposing factors for thromboembolism including oral contraceptives.

Physical examination revealed an acutely ill-appearing woman. Her body temperature was 38 °C. She was in respiratory distress accompanied by low arterial blood pressure (90/60 mmHg), tachypnea (respiration rate 28/min), and tachycardia (heart rate 112 beats/min). On auscultation, right lung sounds were diminished below the scapula. Cardiac auscultation revealed an accentuated pulmonary second sound and a grade 2/6 pansystolic murmur in the lower left parasternal area. Abdominal examination showed no organomegaly. She had moderate bilateral lower extremity edema. The chest X-ray showed bilateral lower lobe infiltrates with mild cardiomegaly and the electrocardiogram was significant for sinus tachycardia and negative T-waves in precordial leads. Arterial blood gas analysis demonstrated hypoxia and hypocarbia with respiratory alkalosis (pH 7.48, PaO_2 75 mmHg, $PaCO_2$ 35 mmHg). Laboratory examination showed mild leukocytosis (white blood cell count 12,000/mm^3 with 48% polymorphs and 45% lymphocytes) and an elevated D-dimer level (6.63 mg/l, positive result >0.5 mg/l). Serologic tests for brucellosis was positive at a titer of 1:320.

Transthoracic echocardiography aiming to evaluate right ventricular functions and pulmonary artery pressure demonstrated a mobile, hyperechoic worm-like thrombus (thrombus-in-transit) entrapped within a PFO (Fig. 1a, b). Right ventricular enlargement (end-diastolic diameter 38 mm in the precordial view) and hypokinesis of the free wall, and elevated systolic pulmonary artery pressure (77 mmHg) estimated from the velocity of the tricuspid regurgitation jet suggested the presence of acute pulmonary embolism. Multidetector computed tomography revealed a huge thrombus, 11.7 cm in length, in the bifurcation of the main pulmonary artery (Fig. 1c). Anticoagulation with unfractionated heparin was started immediately and four separate sets of blood cultures were drawn before the patient was placed on oral doxycycline and rifampicin therapy for brucella infection. Abdominal ultrasonography showed no intra-abdominal pathology, but lower

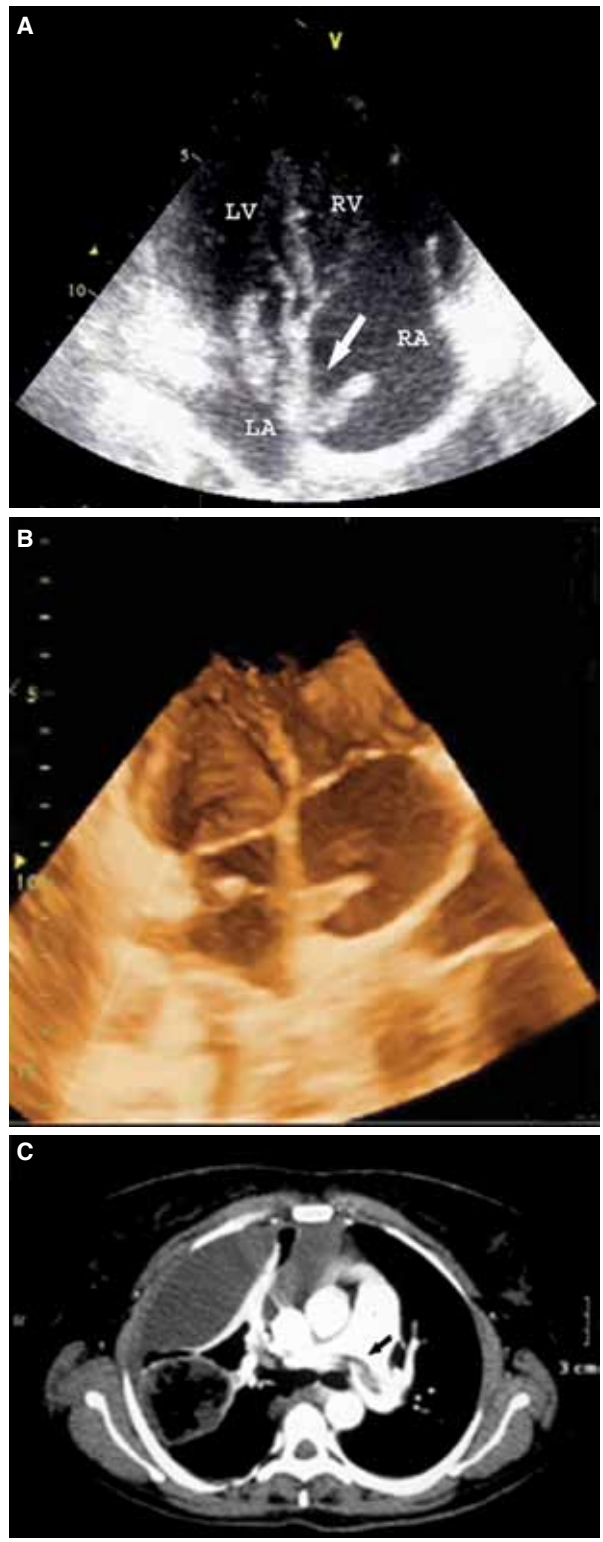

Figure 1. **(A)** Apical 4-chamber transthoracic echocardiographic view shows an entrapped thrombus (white arrow) in the patent foramen ovale. **(B)** Three-dimensional echocardiographic image of the entrapped thrombus. **(C)** Computed tomographic image shows thrombus material in the bifurcation of the pulmonary artery (black arrow).

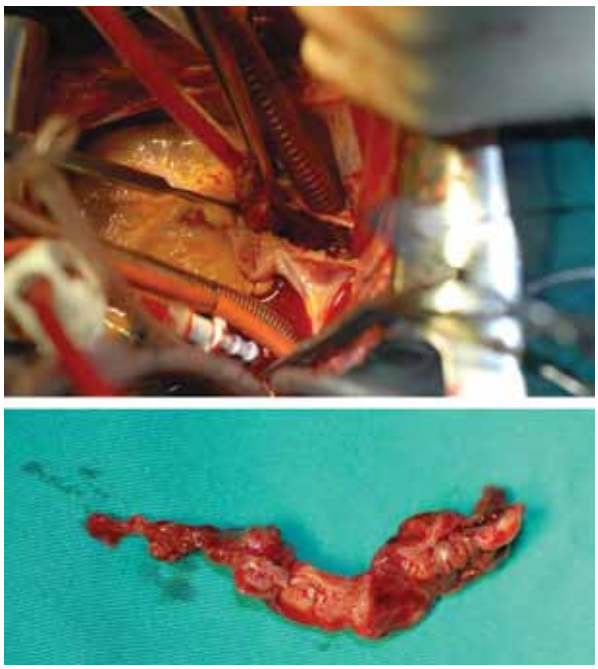

Figure 2. Intraoperative images showing the removal of worm-like thrombus entrapped in the patent foramen ovale.

extremity venous Doppler examination revealed acute thrombosis in the left popliteal vein, lower left superficial femoral vein, and left vena parva.

Considering the huge size of the right heart thrombus and hemodynamically significant acute pulmonary embolism, emergency surgery was planned. After implantation of a vena cava inferior filter distal to the renal veins, open heart surgery was performed. Intraoperatively, an 11-cm thrombus was seen, extending from the right atrium across the PFO into the left atrium (Fig. 2). The interatrial septum was excised *en bloc* with the thrombotic mass and the PFO was closed. Pulmonary thromboendarterectomy was also performed. After surgery, systolic pulmonary artery pressure decreased from 77 mmHg to 38 mmHg and the patient was discharged on the seventh postoperative day.

DISCUSSION

Patent foramen ovale is the most common conduit where an embolus from the venous system is entrapped causing paradoxical embolism. It was identified in 25-30% of an autopsy series[1] and is thought to play a role in cryptogenic stroke in 45-50% of patients younger than 55 years of age, and 28% of patients older than 55 years of age.[2,3] The presence of PFO in acute pulmonary embolism is associated with significantly higher incidences of death and embolic complications. Thus, prompt echocardiography in patients with hemodynamically significant pulmonary embolism could help provide early diagnosis of right heart thrombus and right ventricular dysfunction. Thrombus entrapped in a PFO is a rare form of right heart thromboembolism. In-hospital mortality of thrombus-in-transit is estimated to exceed 45%.[4]

Human brucellosis is a potentially life-threatening multisystem disease. It is a zoonotic disease of bacterial origin. Brucellosis is a multisystem disease with a broad spectrum of nonspecific symptoms that generally occur within two weeks (but sometimes up to 3 months) after inoculation. Deep vein thrombosis is a rare manifestation of brucellosis.[5] Vascular complications due to Brucella infection have rarely been reported in the medical literature. These include thrombosis of the abdominal aorta,[6] popliteal artery aneurysm,[7] cutaneous vasculitis,[8] DVT,[5] portal vein thrombosis,[9] cerebral vein thrombosis,[10] and central retinal vein thrombosis.[11] It is possible that endothelial damage induced directly by Brucella or indirectly through toxins or cytokines is responsible for DVT. In patients with Brucella infection and severe arthritis, immobilization due to pain may serve as a predisposing factor to thrombosis of the lower extremity deep veins.

In our case, DVT associated with Brucella infection was responsible for thrombus-in-transit entrapped in the PFO and also pulmonary embolism. There are few case reports on DVT secondary to Brucella infection, but this is the first report on an entrapped thrombus in a PFO in a patient with Brucella infection.

The appropriate therapy for thrombus-in-transit and acute major pulmonary embolism is not clearly defined. There are several reports on successful outcomes in patients treated with anticoagulation, thrombolysis, or surgery.[12] Each therapy has its own risk. Surgical embolectomy requires major cardiac surgery and the use of cardiopulmonary bypass; anticoagulants or thrombolysis may cause bleeding complications or thrombus fragmentation resulting in pulmonary or systemic ischemic events. Although surgery provides a more definitive therapy and closure of a right-to-left heart communication if present, the ease and rapidity of administration may make anticoagulation or thrombolysis a reasonable option in some patients. In our case, our decision in favor of surgery was based on the size and mobility

of the thrombus and presence of major pulmonary embolism.

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Key words: Brucellosis/complications; foramen ovale, patent/complications; pulmonary embolism/etiology/complications; thrombosis/complications/surgery.

Anahtar sözcükler: Bruselloz/komplikasyon; foramen ovale açıklığı/komplikasyon; pulmoner emboli/etyoloji/komplikasyon; tromboz/komplikasyon/cerrahi.