



## Case Report

## Atrial septal defect can mimic pulmonary thromboembolism after a major surgery



### Abstract

Trauma-related embolic events in pulmonary vascular bed are generally due to fat or thrombus embolism. In this report, we present a patient who had severe hypoxia and tachycardia at postoperative period after surgery of an open tibia fracture. Because of the clinical and electrocardiographic findings, we calculated patients Wells score as “pulmonary embolism likely” (>4 points, 28%–52% pulmonary embolism risk), and we performed chest contrast computed tomography. There was no abnormal finding in contrast to chest contrast computed tomography that could suggest fat or thrombus embolism. Because of persistent hypoxemia, we performed transthoracic echocardiographic examination to exclude an intracardiac shunt. In transthoracic echocardiographic examination, we found an atrial septal defect with intermittent right-to-left shunt due to high central venous pressure.

Trauma-related pulmonary embolism generally occurs due to thrombi or fat globules. Pulmonary thromboembolism (PTE) is found in the range from incidental, clinically insignificant findings to hemodynamic collapse and sudden death. The etiology is consists of local trauma to the vessel wall, hypercoagulability, and stasis of blood, which are known as Virchow triad [1]. These all lead to thrombus formation in the lower extremity veins at postoperative period [2]. Imaging techniques like computed tomography (CT) play a key role in the diagnosis and assist in the recognition of PTE [3].

Atrial septal defect (ASD) constitutes 8% to 13% of all congenital heart defects. Isolated ASD patients are usually asymptomatic and are most often detected at the time of adulthood. Sometimes, these defects are detected when echocardiographic studies are performed for some unrelated reason.

In this study, a case of a 27-year-old man with postoperative hypoxemia secondary to an intracardiac right-to-left shunt due to elevated central venous pressure (CVP) was reported.

A 27-year-old man experienced a car accident, and an open tibia fracture was diagnosed. The tibial fracture was treated with an intramedullary nail, and debridement of the injuries together with removal of the bone fragments was performed. Only a compressive bandage was used; anticoagulation and intravenous fluid was initiated at the postoperative period. During the early postoperative period, patient had dyspnea with a respiratory rate of 22 breaths per minute, blood pressure was 95/50 mm Hg, and hypoxia was detected unresponsive to maximal flow oxygen. Arterial blood gas analysis revealed pH 7.45;  $P_{O_2}$ , 61 mm Hg;  $P_{CO_2}$ , 48 mm Hg; and oxygen saturation, 85% on 100% nonrebreather oxygen mask. There was no pyrexia or central unconsciousness that could suggest fat embolism (FE). The cardiac auscultation and chest radiographic findings were within normal limits.

Electrocardiographic findings revealed incomplete right bundle branch block with a rate of 115 beats per minutes (Fig. 1). Because of the clinical and electrocardiographic findings, we calculated patient's Wells score as “PE likely” (>4 points, 28%–52% PE risk), and we performed chest contrast CT to exclude a pulmonary embolic event. Urgent contrast CT scan of his thorax revealed no thrombosis or fat globules in pulmonary vascular bed (Fig. 2). The patient was transferred to the intensive care unit. We wondered about the possibility of intracardiac shunt due to persistent hypoxemia. So we performed transthoracic echocardiography (TTE). Transthoracic echocardiography confirmed normal ejection fraction and valvular structures. But there was a significant right-to-left shunting across an ASD with 0.73 cm diameter and dilated right ventricular dimensions with mildly elevated pulmonary artery pressure (calculated as 35 mm Hg) (Fig. 3). The interatrial septum was markedly deviated to the left atrial side during systole. QP (pulmonary flow): QS (systemic flow) ratio was approximately 0.7. This observation suggested significant right-to-left shunting. It was thought that the large right-to-left shunting at the atrial level observed earlier was likely related to high right ventricular pressure due to excess of postoperative given fluid. So we measured patient's CVP. Central venous pressure was found high as 16 mm Hg. Intravenous fluid was stopped, and diuretic therapy was started. After a few days, his oxygen requirement decreased. Blood gas evaluation was performed without oxygen (pH 7.4;  $P_{CO_2}$ , 34 mm Hg;  $P_{O_2}$ , 71 mm Hg; and  $HCO_3^-$ , 21 mEq/L). Repeat echocardiogram showed persistent but decreased shunting. Patient was discharged with subcutaneous enoxaparin after the orthopedics consultation, and transesophageal echocardiography was planned to evaluate patient's ASD about transcatheter closure.

Clinical deterioration due to pulmonary dysfunction at postoperative period was generally related to embolic events in the pulmonary arterial system. Most pulmonary embolic event occurs due to venous thromboembolism. Dyspnea is the most frequent symptom, and tachypnea is the most frequent sign of PTE. The accurate and fast identification of patients who have PTE is critical because PTE is a potentially fatal condition, and anticoagulation is associated with the risk of major bleeding. A false diagnosis thus exposes patients to unnecessary risk of death from PTE or of bleeding, which can also be fatal. For these reasons, 2 widely validated clinical decision rules for establishing the clinical probability of acute PTE are available. One of them is Wells scoring system [4]. The Wells rule consists of 7 variables including a judgment of whether PTE is the most likely diagnosis. In this report, the patient's Wells score was classified as “PTE likely” (>4 points, 28%–52% PE risk). So we performed chest CT directly to exclude PTE.

In patients with an unlikely probability, a D-dimer test can be applied to rule out PTE. Fibrin D-dimer is a marker of fibrinolysis, and D-dimer

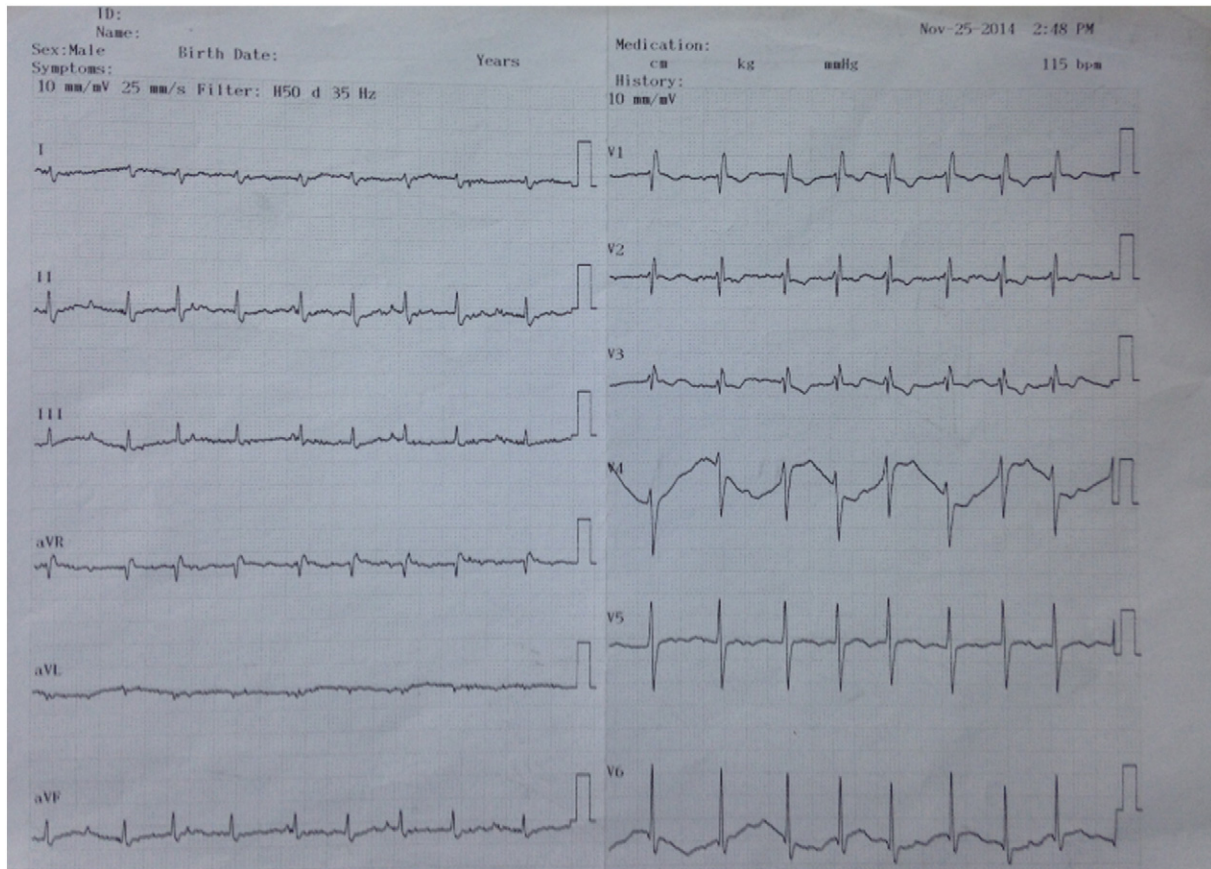


Fig. 1. Electrocardiogram shows tachycardia with incomplete right bundle branch block.

levels are typically elevated in patients with acute thrombotic disease. The sensitivity of a D-dimer test for acute PTE is very high, yet it has poor specificity [5]. Other clinical conditions associated with enhanced fibrin formation, such as malignancy, trauma, disseminated intravascular coagulation, infection, and postoperative states also can give rise to elevated D-dimer levels. We did not study D-dimer level, which gives false-positive result due to patient's postoperative statue. Furthermore,

the combination of a normal, high-sensitivity, quantitative D-dimer test result in addition to an unlikely clinical probability has enough negative predictive value to rule out acute PTE without further imaging.

Atrial septal defect is the second most common congenital heart defect after ventricular septal defect and the most common to become symptomatic in adulthood. Ostium secundum defects account most ASDs. Females are affected more often than males. In normal situation,

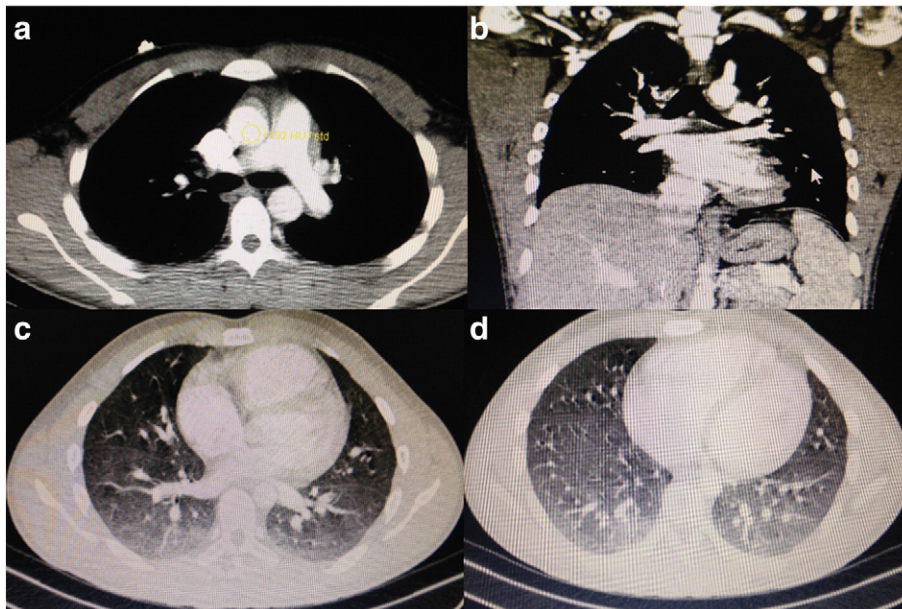


Fig. 2. Patient's chest CT image.

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