



Successful Surgical Pulmonary Embolectomy for Massive Pulmonary Embolism with Multiple Thrombogenic Risk Factors: A Case Report

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ABSTRACT

We report a 36-year old woman who suffered from massive pulmonary embolism with multiple thrombogenic risk factors. She was successfully treated with pulmonary embolectomy. Our report reinforces the importance of early diagnosis in the presence of a high clinical suspicion for pulmonary embolism. Furthermore, surgical pulmonary embolectomy remains one of the most effective treatment methods.

Key Words: Massive pulmonary embolism; multiple thrombogenic risk factors; surgical pulmonary embolectomy

Çoklu Trombojenik Risk Faktörüne Sahip Masif Pulmoner Emboli Olgusunun Başarılı Bir Şekilde Cerrahi Pulmoner Embolektomi ile Tedavisi: Olgu Sunumu

ÖZET

Otuz altı yaşında, çoklu trombojenik risk faktörüne sahip ve masif pulmoner emboli tablosu ile başvuran hastanın pulmoner embolektomi ile başarılı bir şekilde tedavi edildiğini sunuyoruz. Olgumuz pulmoner emboli de erken tanının önemini belirtmektedir. Ayrıca, cerrahi pulmoner embolektominin en etkin tedavi yöntemlerinden biri olduğunu vurgulamaktadır.

Anahtar Kelimeler: Masif pulmoner embolizm; çoklu trombojenik risk faktörü; cerrahi pulmoner embolektomi

INTRODUCTION

Acute pulmonary embolism (PE) is one of the major challenging diseases in the emergency setting. On average, 90% of all mortalities occur within 2 h of the onset of symptoms⁽¹⁾. Therefore, rapid treatment of massive PE is a high priority. The optimization of emergency structures has been demonstrated to significantly reduce the mortality rate from unstable PE⁽²⁾. The reliable exclusion of PE in hemodynamically stable patients remains an additional problem, since in many of these patients the symptoms of PE are barely evident or manifest atypically. Previous studies have shown that PE has been frequently overlooked, and therefore, the mortality rate in such cases is significantly increased^(3,4). One of the most important diagnostic methods in suspected cases of PE is computed tomography (CT) scans of the pulmonary artery^(5,6)

CASE REPORT

A 36-year-old woman was admitted our hospital because of dyspnea. She has been smoking 20 cigarettes per day for 20 years and using oral contraceptive for 5 years. Physical examination at the emergency department showed a blood pressure of 90/50 mmHg and a pulse rate of 110 beats/min. The patient was tachypneic throughout her hospitalization, with a respiratory rate ranging from 20 to 24 breaths/min. On auscultation, crepitant rales were heard in the right basal pulmonary area. Cardiac findings included prominent pulmonic component of the second heart sound. The electrocardiogram showed sinus tachycardia and incomplete right bundle branch block. Laboratory tests showed mild anemia (hemoglobin level, 11.2 g/dL), increased white blood cells (12.4 K/ μ L), an elevated d-Dimer level (941 ng/mL), slightly increased C-reactive

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Submitted: 01.01.2016

Accepted: 16.03.2016

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Available on-line at
www.kosuyoluheartjournal.com

protein (14.04 mg/dL), a PaO₂ of 35 mmHg, a PaCO₂ of 42 mmHg, an SO₂ of 62.3%, and a pH of 7.465. Chest radiography revealed a consolidation view on the right basal pulmonary area. She immediately underwent transthoracic echocardiography, which revealed a normal sized left ventricle, normal systolic function, and severe dilatation in the right ventricle. Contrast-enhanced CT angiography of the chest demonstrated a large, contiguous filling defect extending from the main pulmonary artery to the right and left pulmonary arteries (Figure 1,2). She was referred for an emergency pulmonary embolectomy, since her hemodynamic condition was unstable.

During the operation, after performing a median sternotomy, cardiopulmonary bypass was established by cannulation of the ascending aorta and two caval cannulations. We detected dilatation of the right ventricle. In the setting of partial cardiopulmonary bypass and beating heart, embolectomy was performed through a right and a left pulmonary incision (Figure 3). The patient was weaned off cardiopulmonary bypass, and stable hemodynamics was maintained without inotropic support.

On postoperative day 2, she was discharged from the intensive care unit. All parameters improved markedly. Postoperative transthoracic echocardiography showed marked improvement in right ventricular functions. Lower-extremity Doppler ultrasound was negative for deep venous thrombosis. Results of the hypercoagulability workup including antinuclear antigen, high levels of factor VIII, protein C and protein S activity, protein C and protein S antigen, antithrombin III activity, antithrombin antigen, plasminogen activity, phospholipid IgG/

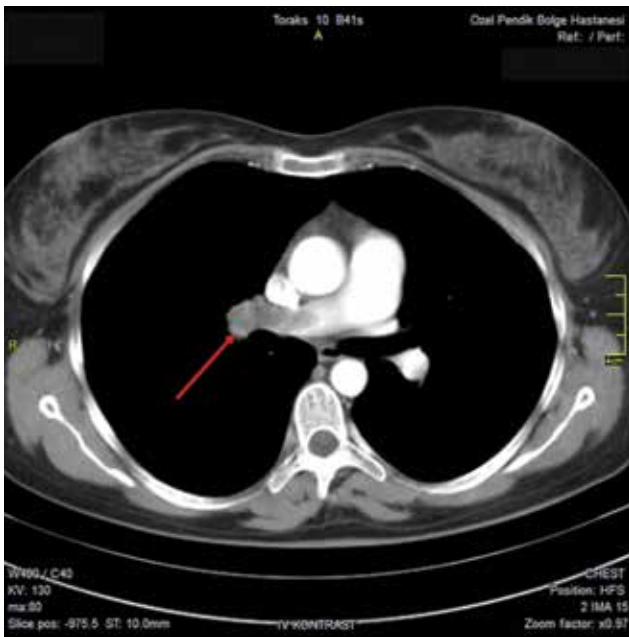


Figure 1. Arrow shows a large, contiguous filling defect extending from the main pulmonary artery to the right pulmonary artery.

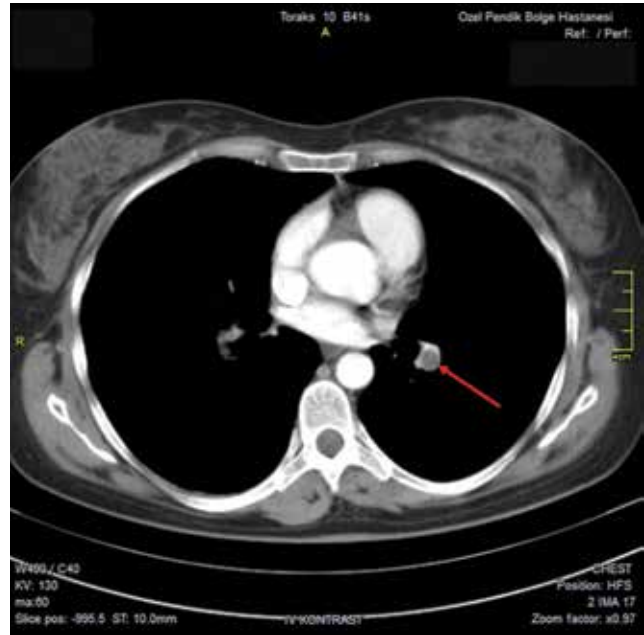


Figure 2. Arrow shows filling defect in the branch of the left pulmonary artery.



Figure 3. Arrows show thrombotic materials extracted from the pulmonary arteries.

IgM, and hyperhomocysteinemia were negative. Our patient had heterozygous Factor V Leiden mutation and multiple risks for thromboembolism (smoking and oral contraceptive use). We planned the prothrombin time/international normalized ratio (PT/INR) to range from 2 to 3 to control warfarin postoperatively. The patient was discharged without morbidity 3 weeks later.

DISCUSSION

Factor V Leiden mutation is the most common hereditary hypercoagulable disease in the United States and involves 5% of the Caucasian population⁽⁷⁾. It leads to activated protein C resistance that has been demonstrated as risk factor for venous thrombosis development⁽⁸⁾. Approximately one out of 1000 patients will develop deep venous thrombosis (DVT) or pulmonary thromboembolism each year. The heterozygous Factor V Leiden increases the risk of developing DVT by 5-7 fold, whereas the homozygous Factor V Leiden increases the risk of developing clots by 25-50 fold⁽⁹⁾. The association between oral contraceptives and PE is established, although only a limited number of studies address the issue^(10,13). Of these, the study by Lauque et al. comprised only 11 case reports and is not recent⁽¹⁰⁾. Significantly, more data exist regarding the association between DVT and contraceptive use. A metaanalysis by Manzoli et al. included many studies and confirmed a significantly increased risk of thrombosis with oral contraceptive use⁽¹³⁾. Despite the wealth of data, the results concerning DVT cannot be directly converted to PE. Nevertheless, the association between oral contraceptives and PE remains undisputed. Regarding the association between thrombophilia and PE, the data from Lauque et al.'s study is insufficient as well. Data from a large retrospective study by Wu et al. indicated a significantly increased risk of PE associated with different thrombophilia subgroups; the risk increased further upon concomitant intake of contraceptives⁽¹⁴⁾. Thus, the risk factors, i.e., contraceptive use and thrombophilia, in addition to a history of DVT/PE, are of tremendous importance in the context of PE⁽¹⁵⁾. Our patient predisposing factors were convenient of literature.

The first successful surgical pulmonary embolectomy was performed in 1924, several decades before the introduction of medical treatment for PE. Pulmonary embolectomy is technically a simple operation. Following the induction of anesthesia and median sternotomy, normothermic cardiopulmonary bypass should be started. Aortic cross-clamping and cardioplegic cardiac arrest should be avoided^(16,17). With bilateral PA incisions, clots can be extracted from both pulmonary arteries down to the segmental level under direct vision. Prolonged periods of postoperative cardiopulmonary bypass and weaning may be necessary for recovery of right ventricular function. With a rapid multidisciplinary approach and individualized indications for embolectomy before hemodynamic collapse, perioperative mortality rates of $\leq 6\%$ have been reported⁽¹⁸⁾. Preoperative thrombolysis increases the risk of bleeding, but it is not an absolute contraindication to surgical embolectomy⁽¹⁹⁾.

This case report emphasizes the importance of early diagnosis in the presence of a high clinical suspicion of PE. An extended workup, including transthoracic echocardiography and CT scan of the pulmonary arteries are mandatory in such a patient, particularly when there are clinical findings suggestive

of PE. Furthermore, surgical pulmonary embolectomy is one of the most effective treatment methods besides thrombolytic and percutaneous catheter-directed treatment, particularly when the patient's hemodynamic condition is unstable.

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