

Successful emergency surgical pulmonary embolectomy for massive pulmonary embolism after urgent cesarean delivery

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Hypercoagulability in pregnancy is responsible for increased risk of venous thromboembolism including pulmonary embolism (PE). Pulmonary embolism in pregnancy is a leading cause of both maternal morbidity and mortality in developed countries. The relative risk of PE during pregnancy increases by four- to six-fold, and the incidence of clinically significant PE is up to 2 per 1000 pregnancies [1, 2]. The risk of PE is highest in the third trimester of pregnancy. Most of the European Society of Cardiology guideline recommendations for the treatment of cardiovascular disease during pregnancy are weak in evidence due to the limited data available [3]. To provide rapid, individualized, expert-based, and multidisciplinary medical decisions for patients with acute PE, Pulmonary Embolism Response Teams (PERTs) are established in many hospitals around the world [4]. Surgical pulmonary embolectomy and thrombolysis are life-saving treatment strategies for hemodynamically unstable pregnant women with high-risk pulmonary embolism [5].

A 40-year-old pregnant woman at 39 weeks of gestation (Gravida 8, Para 9) with no significant cardiovascular diseases was admitted with massive central pulmonary embolism and right ventricular dilatation as well as dysfunction confirmed on computed tomography pulmonary angiography (CTPA, Figure 1A, B) for further treatment. The dominant clinical symptoms were dyspnea, shortness of breath, and chest pain. Physical examination showed hypotension (105/85 mm Hg),

tachycardia (130/min), hypoxemia (oxygen saturation level 92%), and tachypnea (42/min). Laboratory tests showed high D-dimer levels (17189 ng/ml; norm <500), elevated cardiac troponin levels (419 ng/l; norm <45), and high NT-proBNP levels (4987 pg/ml, norm <125). The patient received therapeutic doses of unfractionated heparin monitored with activated partial thromboplastin time. Transthoracic echocardiography showed preserved left ventricular function (EF, 60%), right ventricular enlargement: parasternal long-axis view: 4.15 cm; apical-four-chamber view: right ventricular basal-diameter (RVD1), 5.07 cm; right atrial enlargement (apical-four-chamber view), 33 cm², severe tricuspid regurgitation with elevated tricuspid regurgitation peak gradient (TRPG ≥48 mm Hg; Figure 1C, D), flattening of the interventricular septum: D-shaped left ventricle, severe right ventricular dysfunction with hypokinesia of the basal and mid-right ventricular free wall and apical hypercontractility (McConnell's sign), dilated inferior vena cava, and mild pericardial effusion. Our PERT consisted of a cardiologist, obstetrician, anesthesiologist, and cardiac surgeon. A decision was made to terminate the pregnancy by cesarean section (CC). The temporary inferior vena cava filter (IVC-F) was implanted via the right femoral vein. The CC was performed in a hybrid operating room with cardiac surgeons. Shortly after the CC, the patient developed cardiogenic shock with cardiac arrest in operating room conditions. The sudden hemodynamic collapse was the result

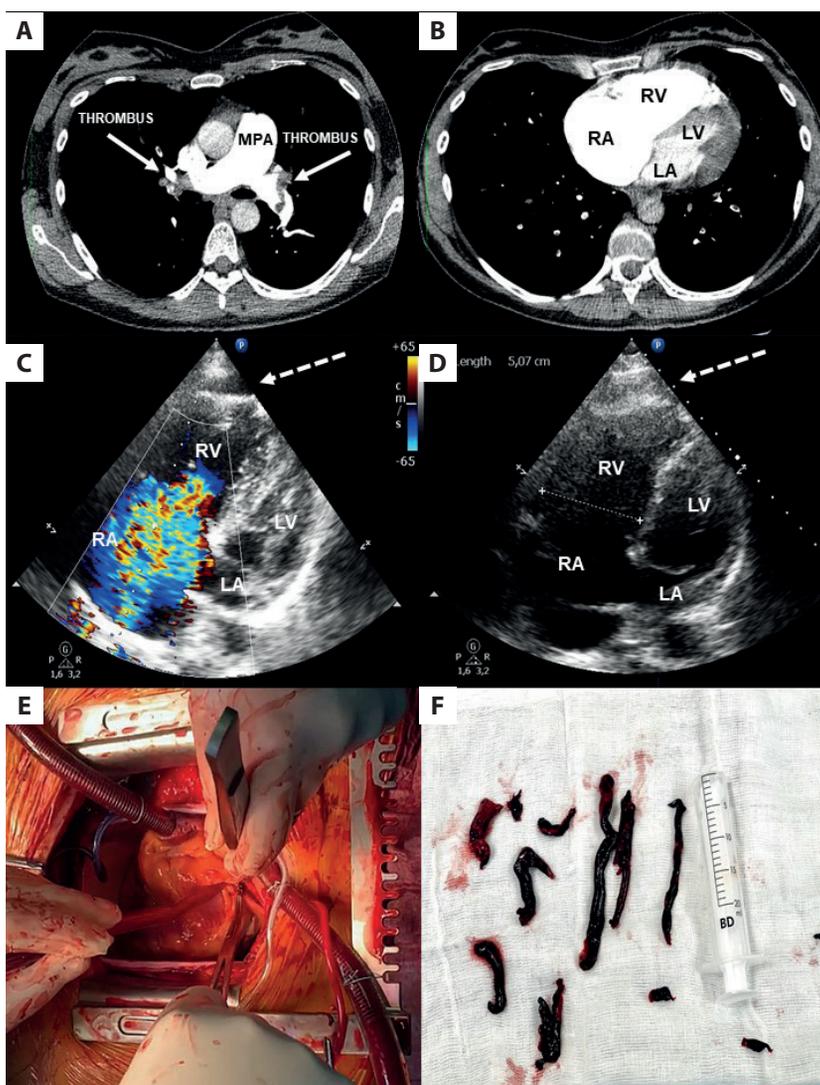


Figure 1. **A.** Computed tomographic pulmonary angiography (CTPA) image before surgical pulmonary embolectomy showing a massive thrombosis of the main pulmonary arteries (arrows). The main pulmonary artery is enlarged. **B.** CTPA image before surgical pulmonary embolectomy showing the right ventricular and right atrial dilatation. **C.** Transthoracic echocardiography (TTE) image (apical four-chamber view) showing severe tricuspid regurgitation with the enlarged right ventricle and right atrium. The arrow is pointing at mild pericardial effusion. **D.** Transthoracic echocardiography (TTE) image (apical four-chamber view) showing the enlarged right ventricle and right atrium. Right ventricular basal diameter (RVD1): 5.07 cm. The arrow is pointing at mild pericardial effusion. **E. F.** Thromboembolic material removed from pulmonary arteries during surgical pulmonary embolectomy.

Abbreviations: CTPA, computed tomographic pulmonary angiography; LA, left atrium; LV, left ventricle; MPA, main pulmonary artery; RA, right atrium; RV, right ventricle; RVD1, right ventricular basal diameter; TTE, transthoracic echocardiography

of displacement of the massive embolic material within the pulmonary circulation. Cardiopulmonary resuscitation was performed. High doses of catecholamines were needed. The decision about emergency pulmonary embolectomy in extracorporeal circulation was made. Surgery was performed by medial sternotomy. The cardiopulmonary bypass was connected between the right atrium and the ascending aorta. The pulmonary trunk was opened. The massive pulmonary emboli were removed from both pulmonary arteries (Figure 1E, F). Total time of cardiopulmonary circulation was 28 minutes. The patient was extubated on the first postoperative day. Doppler-ultrasonography confirmed massive proximal deep-vein thrombosis in the

right lower extremity. The patient received therapeutic doses of low-molecular-weight heparins and was switched to a non-vitamin K antagonist oral anticoagulants (NOAC). The patient's cardiac function and heart size returned to normal within 3 days. The patient was discharged from the hospital with a healthy newborn 9 days after surgery. In each case of pulmonary embolism during pregnancy, the choice of therapeutic approach: thrombolysis or cardiac surgery, should be individualized. There are no direct treatment guidelines for such clinical situations. Literature comparing the effectiveness of thrombolysis and thrombectomy in pregnant women with high-risk pulmonary embolism is still lacking.

Article information

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