

## Successful Treatment of Right Heart Thrombi and Acute Massive Pulmonary Embolism by Repeated Thrombolysis

Marija Svetikiene<sup>1\*</sup>, Vilius Janusauskas<sup>2</sup>, Justina Gričiute<sup>1</sup>, Rimgaudas Katkus<sup>2</sup>, Donata Ringaitiene<sup>1</sup>, Jurate Sipylaite<sup>1</sup>, Kestutis Rucinskas<sup>2</sup> and Pranas Serpytis<sup>2,3</sup>

<sup>1</sup>Center of Anesthesiology and Intensive Care, Vilnius University Hospital, Santariškių Clinics, Lithuania

<sup>2</sup>Clinic of Cardiovascular Diseases, Faculty of Medicine, Vilnius University, Lithuania

<sup>3</sup>Center Emergency Medicine, Faculty of Medicine, Vilnius University, Lithuania

\*Corresponding author: Marija Svetikiene, Center of Anesthesiology and Intensive Care, Vilnius University Hospital, Santariškių Clinics, Lithuania, Tel: +370 612 25352; E-mail: [Marija.Svetikiene@santa.lt](mailto:Marija.Svetikiene@santa.lt)

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### Abstract

We present the case of a 19 year old female who underwent a massive pulmonary embolism with thrombus in right ventricle (RV) and acute RV failure. Thrombolytic treatment had failed and repeated thrombolysis was given after 24 hours. Treatment was successful and on the eleventh day of hospitalization the patient was discharged. The current guidelines do not give clear directions for the management of patients with acute massive pulmonary embolism who do not respond to fibrinolytic therapy. A repeated thrombolysis could be an alternative treatment over surgical embolectomy for these patients.

**Keywords:** Massive pulmonary embolism; Right heart thrombi; Repeated thrombolysis

### Introduction

Pulmonary embolism (PE) is a major cause of mortality, morbidity, and hospitalization in Europe [1-3]. In-transit right heart thrombi are a potentially life-threatening complication of pulmonary embolism [4]. There is little published evidence on the treatment of mobile masses in the right heart. In the current case, we report a potential treatment modality for this situation.

### Clinical Case

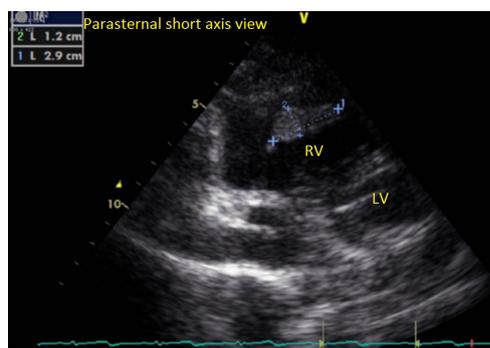
A 19 year old presented to the emergency department with a 12-hour history of a general weakness, shortness of breath (walking distance reduced to 200 m), and chest pain, spreading to the left hand. On admission, the patient had symmetric pulses and blood pressures of 80/60 mmHg; jugular venous pressure was 18 mmHg; the radial and pedal pulses were intact and there was no edema or cyanosis. The patient's respiratory rate was 28 breaths per minute. Air oxygen saturation with face-mask (6 L/min) was 98 percent; arterial blood gas analysis revealed hypoxemia (partial oxygen pressure (PO<sub>2</sub>) = 66 mmHg). The patient's past medical history was unremarkable and included atopic dermatitis treated with topical means and use of hormonal contraceptive Belara (Ethinylestradiol/Chlormadinon 0,03/2 mg) over the past year. The electrocardiogram revealed normal sinus rhythm, normal axis, and normal intervals. Laboratory investigations showed increased lactate 2.61 mmol/l, troponin I 361.6 ng/l, D-dimer 16550 mcg/L, and brain natriuretic peptide 401.3 ng/l. There was no change in kidney and liver function.

The echocardiography showed RV twice bigger than left ventricle (LV); paradoxical intraventricular septal motion; reduced RV inotropy (fractional area change 20%). An agile (2.9 × 1.2 cm) mass—probable

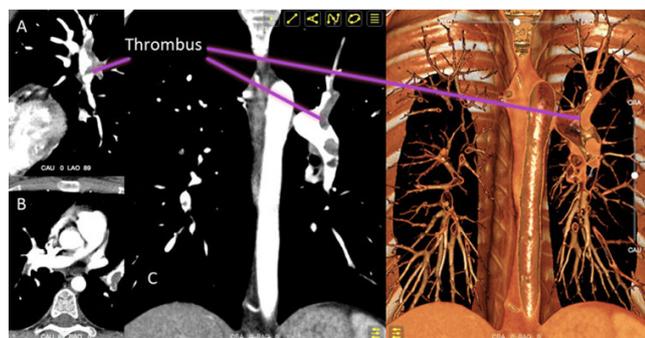
thrombus—was observed in the RV cavity between tricuspid valve (TV) chordae (Figure 1).

Contrast CT angiography has confirmed a massive pulmonary embolus in the main right pulmonary artery extending to the both lobar arteries and below (Figure 2), and thrombi bilaterally in common iliac veins.

The urgent thrombolysis was performed as the patient was hypotensive, tachycardic and hypoxemic. Alteplase was used. The dose of alteplase was calculated according to the manufacturer's guidelines: 1.5 mg/kg in patients with a body weight below 65 kg. The patient's weight was 40 kg and she was given 6 mg IV bolus followed by an infusion of 54 mg over two hours (in total, 60 mg). Thrombolysis was performed successfully with no complications. There was immediate clinical improvement after infusion of alteplase: the heart rate went down to 100 beats per minute and respiratory rate was reduced to 20 breaths per minute, yet the patient was still hypotensive and complained of shortness of breath. Echocardiography was repeated four hours after thrombolysis. There was reduction in the RV diameter; right atrium (RA)/RV max gradient was reduced from 50 mmHg to 25 mmHg, but thrombus was still present in the right ventricle. The patient had experienced no complications related to the thrombolysis but there was some effect after thrombolysis and the patient was reluctant to undergo surgical embolectomy; therefore repeated thrombolysis (alteplase 1 mg/kg/1 h) was performed six hours after the first procedure. After repeated thrombolysis, a further positive effect was observed: reduced shortness of breath and chest pain, and patients' blood pressure increased to 100/60 mmHg. The patient was left on continuous heparin infusion (target APTT: 1.5–2 in normal range) for five days. After 48 hours, echocardiography showed no thrombus in RV left.



**Figure 1:** Echocardiography, two chamber view, thrombus in RV.



**Figure 2:** Contrast CT angiography. A. Sagittal plane; B. Transverse plane; C. Frontal plane. Embolus in the main right pulmonary artery extending to the both lobar arteries and below.

Treatment with Xarelto (rivaroxaban) 15 mg→30 mg was started after five days. On the eleventh day after thrombolysis, the patient was discharged home.

## Discussion

Venous thromboembolism is the third most frequent cardiovascular disease, with an overall annual incidence of 100–200 per 100,000 inhabitants [5,6]. Patients may present with different extents of PE, and different symptoms. Treatment options depend on the patient's clinical state and concomitant diseases (contraindications for thrombolysis). Intravenous anticoagulation with unfractionated heparin (UFH) is recommended for patients with suspected PE; thrombolysis is recommended for hypotensive patients or patients in hemodynamic shock. Surgical embolectomy is recommended for patients who have failed thrombolysis or in whom thrombolysis is contraindicated [1]. Mortality after systemic thrombolysis reaches up to 22.89 percent [7]; mortality following surgical embolectomy for acute pulmonary embolism reaches up to 27.2 percent [8]. Repeat thrombolysis is not recommended according to the current guidelines.

Patients with right ventricle embolus usually present with more severe symptoms and are more frequently treated using thrombolysis

or surgical intervention [9]. In patients with mobile right heart thrombi, treatment selection is still unclear. In our case (patient with mobile mass in RV), the first dose of thrombolytic therapy gave a partial effect. The patient was not taken for surgical embolectomy as she was relatively stable and was not keen to undergo surgical intervention. A second dose of thrombolysis completely relieved the patient's symptoms and hemodynamic state.

Two doses of thrombolysis have been reported in literature previously: van den Biggelaar et al. reported a clinical case of successful treatment of PE with repeated thrombolysis with alteplase at first and urokinase after two hours [10]. Spanodimos et al. reported a case of successful double thrombolysis with alteplase PE treatment [11].

The experience of repeated thrombolysis in massive PE is limited. The outcome of repeated thrombolysis was beneficial in this our case. The second dose of thrombolysis could be considered with expected good outcomes in some patients, but success of repeated thrombolysis in our case provides no guarantee of safety in other cases.

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