CASE REPORT

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Right heart thrombus in a patient with acute pulmonary embolism – a practice in hide-and-seek with guidelines

Tromb u desnom srcu kod bolesnika sa akutnom embolijom pluća – „igra žmurke" sa smernicama

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Abstract

Introduction. Right heart thrombus (RHT) is a relatively rare phenomenon found in 4% of patients with acute pulmonary embolism (PE), and some reports show that the presence of RHT is associated with poor outcomes. The optimal treatment of patients with PE and RHT is still controversial, with no clear consensus. **Case report.** A 38-year-old woman with repeated chest pain and worsening dyspnea was admitted to the hospital. The echocardiographical exam showed a large thrombus floating in the right atrium, protruding through the tricuspid valve into the right ventricle. Massive bilateral pulmonary embolism was confirmed by computed tomography pulmonary angiogram. Bearing these findings in mind and due to the clinical and hemodynamic instability of the patient, thrombolytic therapy was immediately initiated (alteplase), which resulted in excellent clinical outcomes with no adverse events at follow-up. **Conclusion.** Treating patients with PE and RHT is very difficult. While waiting for the results of some future randomized clinical trials on this topic, the treatment of these patients should be based on current guidelines while also considering the patient's hemodynamic stability.

Key words:
computed tomography angiography; diagnosis; echocardiography; heart ventricles; multidetector computed tomography; pulmonary embolism; thrombolytic therapy; treatment outcome.

Apstrakt

Uvod. Tromb u desnom srcu (TDS) je relativno redak fenomen koji se javlja kod 4% bolesnika sa akutnom plućnom embolijom (PE), a pojedine studije ukazuju da je prisustvo TDS povezano sa lošijom prognozom. Optimalna strategija lečenja bolesnika sa PE i TDS je još uvek bez jasnog konsenzusa. **Prikaz bolesnika.** Žena stara 38 godina primljena je u bolnicu zbog bolova u grudima koji su se ponavljali i progresivne dispneje. Ehokardiografskim pregledom uočena je velika fluktuirajuća trombna masa u desnoj pretkomori koja je kroz trikuspidnu valvulu prominirala u desnu komoru. Masivna bilateralna embolija pluća je potvrđena angiografijom pluća primenom kompjuterizovane tomografije. Imajući u vidu ove nalaze, a usled kliničke i hemodinamičke nestabilnosti bolesnice, odmah je primenjena trombolitička terapija (alteplaza), koja je dovela do odličnog kliničkog odgovora bolesnice, bez neželjenih događaja tokom daljeg praćenja. **Zaključak.** Lečenje bolesnika sa PE i TDS predstavlja veliki izazov. Dok se čekaju rezultati budućih randomizovanih kliničkih studija po ovom pitanju, lečenje bi trebalo zasnovati na trenutno važećim preporukama, uzimajući u obzir hemodinamičku stabilnost bolesnika.

Ključne reči:
angiografija, tomografska, kompjuterizovana; dijagnoza; ehokardiografija; srce, komore; tomografija, kompjuterizovana, multidetektor; pluća, embolija; tromboliza, terapijska; lečenje, ishod.

Introduction

Pulmonary embolism (PE) is one of the leading causes of death in most countries [1, 2]. Right heart thrombus (RHT) is detected echocardiographically in 4% of patients with PE [3]. Some reports suggest that in patients with acute PE, the presence of RHT was significantly associated with an increase in 30-day mortality [4]. On the other hand, the international Right Heart Thrombi European Registry (RiHTER) showed that 30-day mortality was correlated with hemodynamic consequences of the PE and not with the RHT characteristics [5]. There are several therapeutic approaches for treating patients

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with PE and RHT, such as thrombolytic therapy, surgical and percutaneous embolectomy, and anticoagulant therapy with heparin [6], but the optimal therapeutic approach for these patients is still subject to debate. Although some studies (e.g., a meta-analysis of 177 cases with RHT and PE) [7] showed a preference for thrombolytic therapy, the potential benefits of thrombolysis in clinically stable patients with RHT and PE are still unclear.

Case report

A 38-year-old woman was admitted to the coronary care unit of the General Hospital Valjevo, Serbia due to symptoms of repeated chest pain and dyspnea. In the patient's medical history, there was information of a deep venous thrombosis (DVT) incident some time ago.

On admission, the patient was hypotensive (blood pressure was 70/50 mmHg) and tachycardic, with signs of peripheral cyanosis, while the other findings were unremarkable. Electrocardiography presented a sinus tachycardia with a heart rate of 132 bpm, slight axis deviation to the right, incomplete right bundle branch block (RBBB), as well as S1Q3T3 (Figure 1). On admission, oxygen saturation (SaO_2) was 86%, and hypoxemia, with the values of pO_2 = 67 mmHg and pCO_2 = 21 mmHg, was observed. Laboratory tests showed increased value of white blood cell count [6.9 × 10^9/L, reference range (RR): 4.0–10.0 × 10^9/L], lower level of hemoglobin (Hgb) (110 g/L, RR: 120–180 g/L), high C-reactive protein (CRP) (113.5 mg/L, RR: 0.1–8.2 mg/L), lower values of total proteins (58 g/L, RR: 65–80 g/L) and albumins (29 g/L, RR: 35–50 g/L), as well as increased values of D-dimer (> 1,050 mcg/L, RR: < 380 mcg/L) and high sensitivity troponin (312.6 pg/mL, RR: < 5.6 pg/mL), while other parameters were unremarkable.

Transthoracic echocardiography was performed, and a large thrombus was discovered floating in the right atrium, protruding through the tricuspid valve into the right ventricle (RV) (Figure 2A). The RV was enlarged [RV outflow tract, (RVOT), was 36 mm], systolic blood pressure in the RV was 55 mmHg, tricuspid annular plane systolic excursion (TAPSE) was 17 mm, *vena cava inferior* was 22 mm, and tricuspid regurgitation (TR) 3+ was registered. The patient

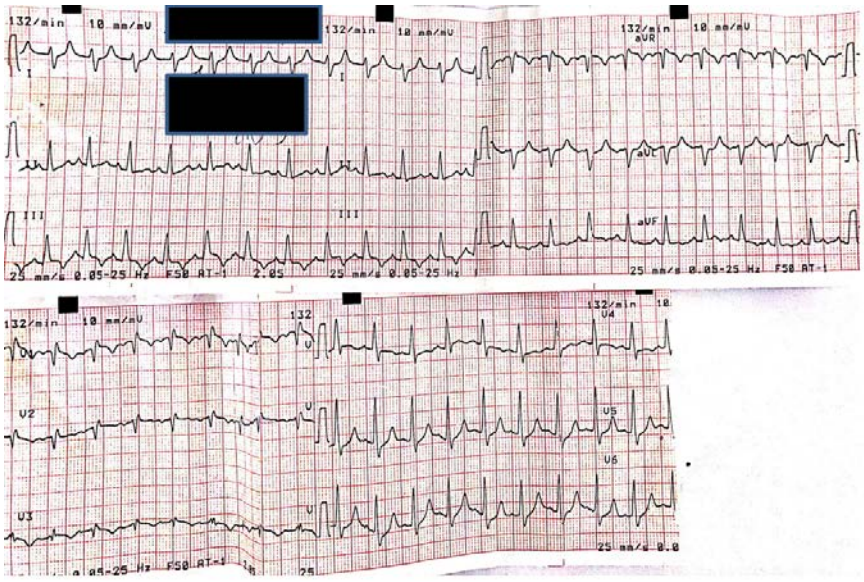

Fig. 1 – Electrocardiographic (ECG) finding of the presented patient on admission to the coronary care unit. ECG registered sinus tachycardia with a heart rate of 132 bpm, slight axis deviation to the right, incomplete right bundle branch block, as well as S1Q3T3. Black blocks overlap the patient's personal data.

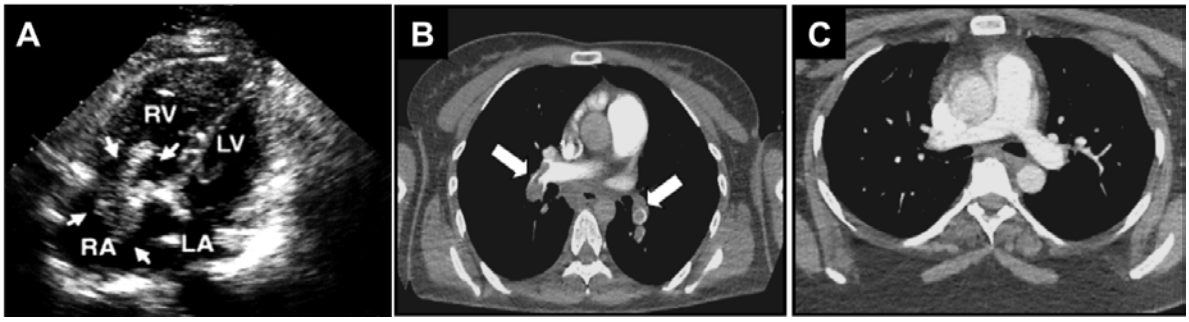

Fig. 2 – A) Transthoracic echocardiography showed a large thrombus floating in the right atrium (RA), protruding through the tricuspid valve into the right ventricle (RV); B) Computed tomography pulmonary angiography demonstrated bilateral pulmonary embolism; C) Follow-up control six months later: multidetector computed tomography showed complete resolution. LV – left ventricle; LA – left atrium.

underwent urgent multi-slice detector computed tomography (CT) pulmonary angiography (CTPA), which revealed bilateral PE and dilatation of the RV (Figure 2B). Bearing in mind the echocardiographic and CTPA findings, we decided to apply thrombolytic therapy since the patient was clinically unstable, with the Pulmonary Embolism Severity Index (PESI) score of 108 and simplified PESI (sPESI) score of 3. After the CTPA procedure, therapy was initiated immediately with intravenous unfractionated heparin 8,000 IU bolus (weight-adjusted bolus), after which thrombolytic therapy (alteplase) was applied, according to the protocol for PE (100 mg of drug-infused peripherally over two hours, with gastroprotection). Thrombolytic therapy was accomplished without complications, and low-molecular-weight heparin was administered for five days. On day six, novel oral anticoagulant therapy (dabigatran 150 mg twice a day) was introduced. During hospitalization, the patient was clinically stable, with mild dyspnea at rest. A high level of CRP and a low levels of total proteins and albumins indicated an infection (urinary tract infection was observed), which was solved by parenteral antibiotics therapy. Analyses carried out in search for an eventual tumor (tumor markers and multi-slice detector CT of abdomen and pelvis) and autoimmune diseases [antinuclear antibodies (ANA) and extractable nuclear antigens antibodies (ENA), anti-neutrophil cytoplasmic antibodies (ANCA), C3, C4, antiphospholipid antibodies, and rheumatoid factors] came out negative. Doppler ultrasound of the lower extremities was also performed, which showed no signs of a new incidence of DVT. The echocardiographic evaluation on the seventh day of hospitalization showed no signs of intracardial thrombus, normal ejection fraction (65%), partial recovery of RV (RV = 34 mm, systolic blood pressure of RV = 43 mmHg), and mild tricuspid regurgitation. After discharge, the patient had the polymerase chain reaction (PCR) assay done for the genes coding the coagulation factor V (Leiden) and the plasminogen activator inhibitor type 1 (PAI-1). The results of the PCR test showed that both genes had mutations that carry a risk of thrombophilia, and according to this, lifelong oral anticoagulant therapy was recommended. On follow-up control, six months later, it was noted that the patient had not suffered any adverse events during that time, including no new episodes of DVT. The control multidetector CT showed complete resolution (Figure 2C).

Discussion

Right heart thrombus is a relatively rare finding in patients with PE, but their prevalence may reach even 22% in high-risk patients [8, 9]. Barrios et al. [9] have shown that RHT is an independent predictor for all-cause of death, PE-related death, and recurrent venous thromboembolism, especially in hemodynamically stable patients. Meta-analyses published so far show that a high mortality rate exists in patients with PE and RHT. In the first meta-analysis published in 2002, the mortality rate was 27% [10], while in a recently published one, the mortality rate was lower (16.7%) [3]. However, it is still unknown whether RHT is the cause or just an indicator of adverse outcomes because the results of the RiHTER trial suggest that RHT characteristics such as size, morphology, or mobility are not correlated with short-term outcomes [5]. Optimal management of patients with PE and RHT is not defined clearly yet, because of a low number of cases and the absence of randomized clinical trials. The benefits of thrombolysis have been shown in high-risk and selected intermediate-high-risk cases according to current guidelines [11]. In reports with small series of patients with PE and RHT, a favorable outcome was reported [5, 9, 12], as well as in the study of Rose et al. [10], who described an improved survival rate in the thrombolytic therapy group compared to anticoagulant therapy and surgery. On the other hand, a study that included 325 patients with PE and RHT suggested no significant difference between reperfusion therapy and anticoagulant therapy regarding mortality and bleeding but that there was a higher risk of recurrences in the reperfusion therapy group [13]. Surgical embolectomy is another treatment option; it should be applied in patients where thrombolysis is contraindicated or ineffective or in patients with *foramen ovale* and potential systemic embolization risk [6, 8]. In patients with PE and RHT, parenteral anticoagulant therapy can be used as first-line therapy or additional therapy following thrombolytic therapy or surgery. Anticoagulant therapy should be used as first-line therapy in clinically stable patients and in cases with a high risk of bleeding [13].

In this case, the choice of thrombolytic therapy based on the hemodynamic instability of the patient resulted in good clinical outcomes, complete thrombus resolution, and RV function recovery.

Conclusion

This case demonstrated the difficulty of managing patients with PE and RHT without hard evidence for optimal treatment. While waiting for more data that would result from conducting more randomized clinical trials on this topic, the treatment of these patients should be based on current guidelines regarding their hemodynamic stability.

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