Controversial Fibrinolytic Therapy for Submassive Pulmonary Embolism Related to Right Heart Thrombus

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Introduction

Submassive pulmonary embolism (SPE) represents a subgroup of patients with pulmonary embolism (PE) who are hemodynamically stable but presents signs of right ventricular (RV) dysfunction at the echocardiogram.[1] The role of thrombolytic therapy for SPE is controversial.[1] We describe a case of SPE related to right heart thrombus (RHT) complicated with cardiorespiratory arrest (CRA) and death after fibrinolytic therapy.

Case Report

A 32-year-old female patient was admitted to the emergency department with shortness of breath, which started suddenly, 24 hours earlier. She reported an episode of self-limited right calf pain 15 days earlier, and had past medical history of obesity, smoking and oral contraceptive use. At physical exam, the patient presented blood pressure of 130/70 mmHg, heart rate of 122 bpm, respiratory rate of 38 bpm, and oxygen saturation level of 88 percent at pulse oximetry. Cardiac auscultation revealed regurgitating systolic murmur (3+/6+) at the tricuspid area, fixed P2 splitting at the pulmonary area, and third heart sound most audible at the left esternal border region, while no abnormalities were identified on pulmonary auscultation. Electrocardiogram on admission showed sinus tachycardia with S1Q3T3 pattern (Figure 1). Chest x-ray and laboratory tests showed no relevant abnormalities.

The patient developed progressive respiratory distress, being admitted to the intensive care unit. Transthoracic echocardiogram (TTE) showed right atrial (RA) and right ventricle (RV) enlargement, RV systolic dysfunction, septal paradoxical motion, pulmonary artery systolic pressure of 60 mmHg, and a large mobile thrombus inside the right chambers measuring 3.9 cm x 1.0 cm (Figure 2).

Due to the SPE diagnosis and the low risk of bleeding, fibrinolytic treatment with streptokinase (the only fibrinolytic agent available at the service) was chosen. The adopted infusion regimen was 250.000 UI in 30 minutes, followed by 100.000 UI/h during 24 hours. Although there was an initial clinical improvement, the patient had CRA in pulseless electrical activity five hours after the start of drug infusion, without return to spontaneous circulation.

Discussion

PE is a potentially fatal disorder for which anticoagulation therapy improves the outcome.[2] Patients with PE can be divided in three groups according to their risk of death or major complication.[3]

- Massive PE: characterized by systemic hypotension (i.e., a systolic arterial pressure < 90 mmHg or a drop in systolic arterial pressure of at least 40 mmHg for at least 15 min not caused by new-onset arrhythmias) or cardiogenic shock (manifested by evidence of tissue hypoperfusion and hypoxia).[1]
- Non-massive PE: diagnosis is established by the absence of systemic hypotension and cardiogenic shock.
- Submassive PE: within the non-massive PE group, SPE includes patients whose RV dysfunction (or hypokinesis) is confirmed by echocardiography or those who have troponin elevation.[1,3]

Despite being characterized by normotension, SPE is also a major cause of early death, its prognosis being different from that of others with non-massive PE and normal RV function.[1] In regards of massive PE, treatment with fibrinolytic agents is well-stablished by different guidelines;[3,4] however, thrombolytic therapy for patients with intermediate-risk (i.e., submassive) is still controversial.[1]

Some literature supports the use of heparin treatment in SPE, whereas some suggests that these patients are better candidates for early thrombolysis therapy.[1,5] Despite the favorable effects of thrombolysis on improving RV function and pulmonary perfusion, different studies have not agreed on its benefits for preventing clinical deterioration, reducing pulmonary artery pressure and improving comprehensive outcomes and bleeding risk. Fibrinolytic therapy prevented hemodynamic decompensation, but increased the risk of major bleeding and stroke.[5]

In 2014, a meta-analysis of randomized trials with 2,115 patients with PE, including SPE, compared anticoagulation with thrombolysis. In individuals with SPE, thrombolysis was associated with lower mortality (OR, 0.48; 95%CI, 0.25 - 0.92) with number-needed-to-treat 65, but more major bleeding events (OR, 3.19; 95%CI, 2.07 - 4.92), with number-needed-to-harm 18. Therefore, use of thrombolytic therapy in these patients continues to be controversial.[6]

Keywords

Pulmonary Embolism/therapy; Pulmonary Artery; Thrombolytic Therapy; Echocardiography.

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Manuscript received September 18, 2017; revised September 25, 2017; accepted October 10, 2017.

DOI: 10.5935/2318-8219.20180005

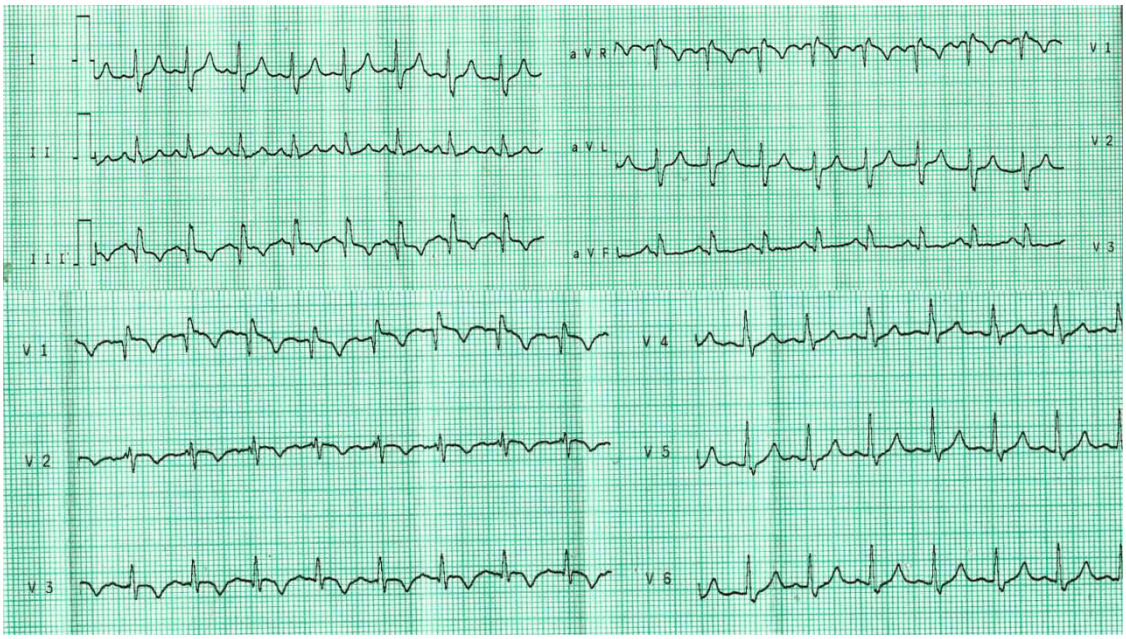

Figure 1 – *Sinus tachycardia with S1Q3T3 pattern shown on electrocardiogram.*

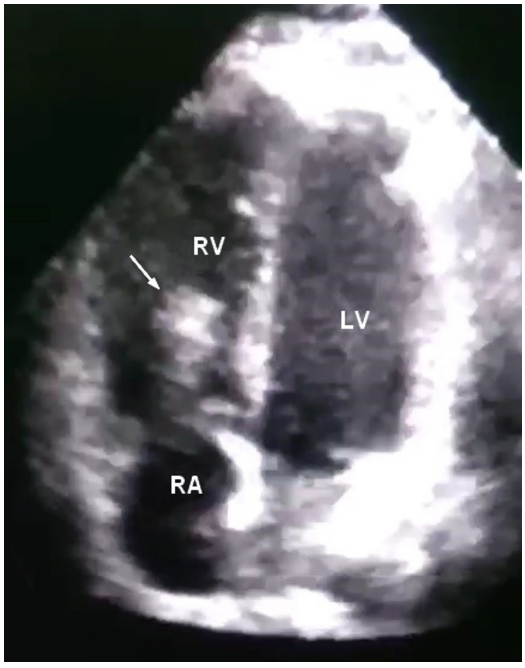

Figure 2 – *Mobile thrombus measuring 3.9 cm x 1.0 cm.*

Thrombolytic therapy becomes even more controversial in the lights of identification of a mobile RHT. Detection of RHT in the context of PE is uncommon (4 – 18%) and increases the risk of mortality associated with RV dysfunction beyond the presence of PE alone.[7] The thrombus of the case was morphologically serpiginous and very mobile, being classified as a type A thrombus.[7] The use of anticoagulation and thrombolysis is sometimes dismissed in patients with RHT because it is thought to be potentially hazardous, as the thrombi may embolize to the already compromised pulmonary circulation. In stable patients, anticoagulation can be proposed as an isolated treatment, especially when there is a high bleeding risk.[7]

The patient described in this report had SPE associated with a mobile RHT having a massive PE as complication.

Conclusion

The use of fibrinolytic therapy for SPE with mobile RHT is still controversial. We report a case in which thrombolysis may have caused a massive PE leading to a poor outcome.

Authors' contribution

Research creation and design: Santos ECL, Pereira DRB, Lima SO, Soeiro APM, Aquino MAR, Dompieri LT; Data acquisition: Santos ECL, Pereira DRB, Lima SO, Soeiro APM, Aquino MAR, Dompieri LT; Data analysis and interpretation: Santos ECL, Pereira DRB, Lima SO, Soeiro APM, Aquino MAR, Dompieri LT; Statistical analysis: Santos ECL, Pereira DRB, Lima SO, Soeiro APM, Aquino MAR, Dompieri LT; Manuscript drafting: Santos ECL, Pereira DRB, Lima SO, Soeiro APM, Aquino MAR, Dompieri LT; Critical review as to important intellectual content: Santos ECL, Pereira DRB, Lima SO, Soeiro APM, Aquino MAR, Dompieri LT.

Potential Conflicts of Interests

The authors declare that they have no conflicts of interest regarding the publication of this paper.

Funding Sources

This study had to external funding sources.

Academic Association

This study is not associated with any graduate studies.

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