

# Complexity of Serpiginous Right Atrium Thrombus Management in Acute Pulmonary Embolism Patient: A Clinical Case Report

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## Abstract

The presence of the right atrial thrombus (RAT) is a life-threatening condition often associated with acute pulmonary embolism (PE). This case report details a 63-year-old male patient who presented with a serpiginous RAT and a massive PE. Despite the administration of both anticoagulation and fibrinolytic therapies, the patient unfortunately experienced sudden cardiac arrest and succumbed to the condition.

## Keywords

Thrombus, Echocardiography, Anticoagulation

## 1. Background

A floating right atrial thrombus (RAT) is often associated with cases of massive pulmonary embolism. The etiology of RAT is diverse and includes deep vein thrombosis. The clinical implications of RAT are significant, with potential outcomes including severe complications or mortality. The management of RAT remains contentious due to the absence of standardized international guidelines. Although treatments such as anticoagulation therapy and surgical embolectomy have demonstrated efficacy, the mortality rate remains notably high, with nearly 25% of patients not surviving the condition. On the other hand, neglecting to treat RAT almost invariably leads to fatal outcomes [1] [2].

## 2. Case Presentation

A 63-year-old male presented to the emergency department with complaints of feeling unwell since getting out of bed. He was discharged from another hospital

three days prior, having undergone a total prostatectomy for prostate cancer two weeks earlier. Postoperatively, he had been on a regimen of 4000 IU per day of prophylactic low molecular weight heparin. Since his discharge, he reported experiencing dyspnea with minimal exertion. On the morning of presentation, he experienced a presyncope upon rising from bed. A friend, who is a firefighter, advised him to seek medical attention. Upon arrival at the emergency department, the patient was conscious and appeared in relatively good general condition. History noted no cardiovascular diseases.

### 2.1. Physical Examination and Exploration Results

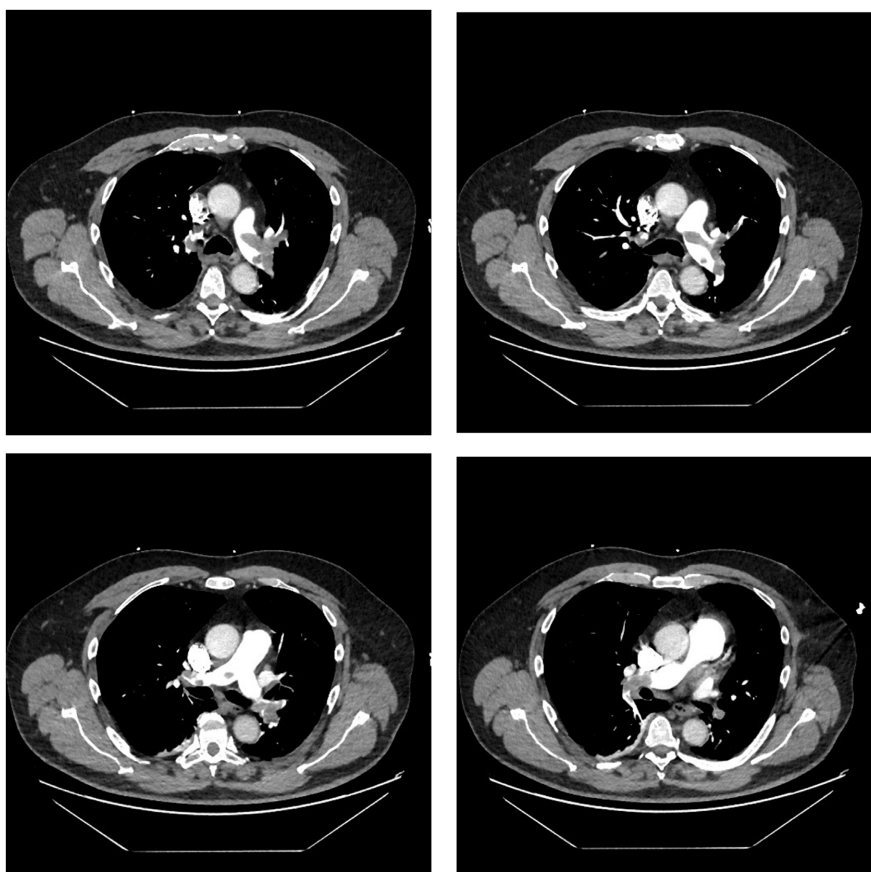
The physical examination revealed a blood pressure of 112/87 mm Hg, a heart rate of 101 beats per minute, a temperature of 36.8 degrees Celsius, a peripheral oxygen saturation of 90% on room air, and a respiratory rate of 46 breaths per minute. The cardiovascular examination was unremarkable except for regular tachycardia, and pulmonary auscultation was also normal. An electrocardiogram (ECG) performed immediately showed an incomplete right bundle branch block, sinus tachycardia at 104 beats per minute, and an S1Q3T3 pattern. Laboratory results indicated hemoglobin at 13.5 g/dL, white blood cell count at  $11.4 \times 10^9/L$ , markedly elevated D-dimer levels over 10,000 ng/mL, and arterial blood gas analysis revealed a shunt effect with  $PCO_2$  at 23 mm Hg and  $PO_2$  at 55 mm Hg. All other laboratory findings are summarized in **Table 1**. An emergent computed tomography pulmonary angiogram (CTPA) confirmed extensive proximal and distal pulmonary embolism (PE) in both lung fields, with thrombus at the bifurcation of the pulmonary artery trunk and in both pulmonary artery branches, without evidence of pulmonary infarction (**Figure 1**).

Transthoracic echocardiography (TTE) revealed the right ventricular dilation with systolic dysfunction and the presence of a large serpiginous thrombus in the right atrium measuring approximately 5 cm in diameter, oscillating between the atrium and the right ventricle through the tricuspid valve (**Figure 2**).

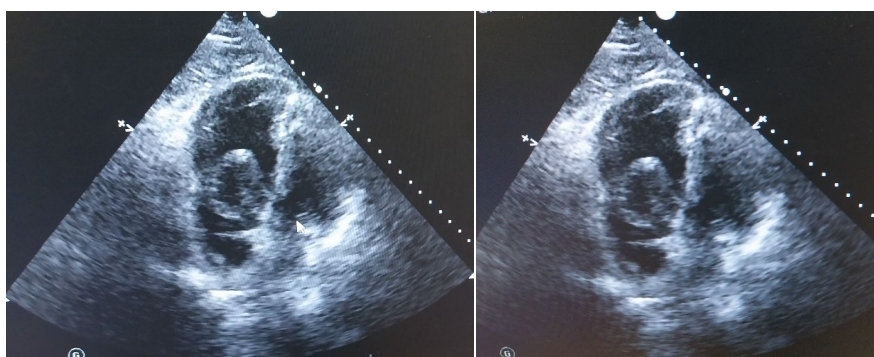
### 2.2. Management

After receiving a 5000 UI loading dose bolus of unfractionated heparin, the patient was immediately admitted to the cardiac intensive care unit, where his hemodynamic state remained relatively stable under continuous heparin infusion. The family was informed of the possibility of fibrinolysis despite the high hemorrhagic risk, as the patient had recently undergone surgery. A few hours later, the patient began to vomit, became desaturated, and was put on oxygen at a rate of 15 liters per minute via mask. Alteplase was administered with an initial bolus of 10 mg, followed by 90 mg over 2 hours. The intensive care unit agreed to the transfer; however, as the patient was leaving the room, he went into cardiac arrest. We performed cardiac resuscitation and administered a 1 mg bolus of adrenaline, followed by 1 mg every 3 minutes. The patient was intubated, and we continued cardiopulmonary resuscitation. After a few minutes, he regained a heart rhythm briefly but then unfortunately fell into asystole again. After an hour of resuscitation efforts, we decided to cease resuscitation,

and the death was communicated to the family, whose members were still on site.



**Figure 1.** CTPA: Bilateral massive pulmonary embolism.



**Figure 2.** Transthoracic echocardiography: Right atrium thrombus.

**Table 1.** Results of biological laboratory findings.

Exam	Results	Laboratory referral range
Arterial blood gas	PH: 7.56 mm Hg	7.35 - 7.45
	PCO <sub>2</sub> : 23 mm Hg	35 - 48
	PO <sub>2</sub> : 55 mm Hg	83 - 108
	HCO <sub>3</sub> : 20.4 mmol/l	22.2 - 28.3

## Continued

<b>Hb</b>	13.5 g/dl	13.4 - 16.7
<b>PLT</b>	250 G/L	150 - 400
<b>WBC</b>	11.03 G/L	4 - 11.00
<b>PT</b>	91%	70 - 100
<b>ACR</b>	0.99	0.8 - 1.2
<b>Fibrinogen</b>	4.14 g/l	2.00 - 4.00
<b>D-Dimers</b>	>10000 ng/ml	<600
<b>Blood Ionogram</b>	Na <sup>+</sup> : 138 mmol/l	136 - 145
	K <sup>+</sup> : 4 mmol/l	3.4 - 4.5
	Chlore: 102 mmol/l	98 - 107
<b>ASAT</b>	30 U/l	5.00 - 40
<b>ALAT</b>	28 U/L	5.00 - 41
<b>AP</b>	74 U/L	40 - 129
<b>GGT</b>	93 U/L	10 - 71
<b>Troponin</b>	93.41 pg/mL	0 - 14
<b>NT pro BNP</b>	191 pg/mL	0 - 125
<b>CRP</b>	14.2 mg/L	0 - 5
<b>Creatinine</b>	102 µmol/l	59 - 104
<b>MDRD</b>	64.01 ml/min/1.73m <sup>2</sup>	
<b>CKD-EPI</b>	67.08 ml/min/1.73m <sup>2</sup>	

Hb: Hemoglobin; PLT: Platelets; WBC: White blood cell; PT: Prothrombin rate; ASAT: Aspartate aminotransferase; ALAT: Alanine aminotransferase; GGT: Gamma-glutamyl transpeptidase; AP: Alkaline phosphatase; NT pro BNP: N-terminal pro brain natriuretic peptide; CRP: C reactive protein; MDRD: Modification of diet in renal disease; CKD-EPI: Chronic kidney disease-epidemiology collaboration.

### 3. Discussion

Regardless of the heart chambers involved, the presence of intra-cardiac thrombi is associated with pulmonary embolism (PE) in 7% of cases, according to an autopsy study published in a Swedish journal. The same study found that the prevalence of PE increases to 37% if the thrombus is in the right atrium. The diagnosis of right heart thrombus (RHT) is often made using transthoracic echocardiography (TTE), although transesophageal echocardiography (TEE) is highly sensitive. However, TEE is not often quickly available and is invasive, particularly in patients who are typically clinically unstable, which gives a major role in TTE [3] [4]. According to a study published in the European Heart Journal in 1989, echocardiography is considered an essential tool for classifying right heart thrombi. Type A thrombi are serpiginous or worm-like, highly mobile, and associated with a very poor prognosis, which was the case with our patient. Type B thrombi are relatively immobile and have a better prognosis. Type C thrombi are intermediate between the two in terms of mobility and prognosis [5].

Although technological advances have made it possible to diagnose right atrial thrombi, treatment remains a challenge worldwide. Anticoagulation, thrombolysis, surgical embolectomy, and percutaneous retrieval techniques are the main treatment options currently available. Despite their proven efficacy in managing thromboembolic diseases, their use in RAT-associated pulmonary embolism (PE) remains perplexing and ambiguous due to the high mortality rate. However, some of these therapeutic options demonstrate superior efficacy compared to others. Fibrinolysis and surgical thrombectomy are associated with a significant reduction in mortality rates in cases of pulmonary embolism associated with RAT. Sometimes, both therapies are sequentially employed, but outcomes are not consistently positive, as cases of death still occur. This was evident in our case, where we initiated treatment with heparin therapy followed by thrombolysis. These variations in therapeutic approaches highlight the lack of international standardized consensus in the management of PE associated with RAT [1] [5]-[8]. Athappan *et al.* found that initial anticoagulation treatment was unsuccessful in 39.4% of cases, justifying the consideration of thrombolytics as a secondary intervention. Mortality rates are approximately 90% in untreated patients, which decrease to 18.3% with thrombolysis-based treatment and further to 13.9% with surgical intervention, according to the same meta-analysis. Thrombolysis also plays a crucial role, showing superior outcomes in hemodynamically unstable patients compared to surgical embolectomy [9]. A single-agent anticoagulation therapy was followed by pulmonary and cardiovascular complications in the case described by Rai *et al.* This prompts consideration that this therapeutic option may not be the optimal first-line treatment for all patients with right heart thrombus (RHT), even when they are hemodynamically stable or lack other signs of severity associated with PE in the presence of RAT [10] [11]. The current research projects are emphasizing using catheter-directed-thrombectomy and results are evidently remarkable [12]-[14].

#### 4. Conclusion

Right atrium thrombus is commonly associated with massive PE, presenting a significant challenge in modern medicine due to the lack of clear guidelines for its management. Research should prioritize rapid detection and early intervention because prognosis remains uncertain in many cases. Although thrombolysis and surgical approaches have shown promise in reducing mortality rates, they are still insufficient to provide definitive guidance to healthcare providers for treating patients with RAT.

#### Conflicts of Interest

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

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### Abbreviations List

CTPA	Computed Tomography Pulmonary Angiogram
IU	International Unit
PE	Pulmonary Embolism
RAT	Right Atrium Thrombus
RHT	Right Heart Thrombus
TTE	Transthoracic Echocardiography
TEE	Transesophageal Echocardiography

### Appendix: Take Home Messages

- 1) Regardless of the presence of severe hemodynamic signs, a right atrial serpiginous thrombus is associated with pulmonary embolism, which often carries a very poor prognosis.
- 2) Although thrombolysis is typically indicated in cases of hemodynamic failure in PE, its use in RAT associated with PE patients can improve survival chances and especially bearing in mind that it is also reasonable to consider a surgical embolectomy.