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(CASE REPORT)



CAUGHT IN TRANSIT: A FREE-FLOATING SERPIGINOUS RIGHT ATRIAL THROMBUS IN ACUTE PULMONARY EMBOLISM – A CASE REPORT

CHOUKRI YASSER ¹, HSAIN AMAL ^{2,*}, KHAOUA HARCH EL KORAN ¹, DEKKAK KHADIJA ², LAZRAQ MARIAM ¹, BAHRI YASMINE ¹, CHAIMAE EL ASSOULI ¹, MOUINE NAJAT ¹, MALKI MOHAMED ² and AATIF BENYASS ³

¹ Clinical cardiology department, Cardiology center, Mohammed V Military instruction Hospital of Rabat, Mohammed V university, Rabat, Morocco.

² Non invasive cardiac explorations, Cardiology center, Mohammed V Military instruction Hospital of Rabat, Mohammed V university, Rabat, Morocco.

³ Head of Cardiology Center, Mohammed V Military instruction Hospital of Rabat, Mohammed V university, Rabat, Morocco.

* Corresponding Author

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ABSTRACT

Right heart thrombi are rare but potentially life-threatening complications of acute pulmonary embolism.

We report the case of a 57-year-old hemodynamically stable woman with pulmonary embolism and a large free-floating right atrial thrombus associated with right ventricular dilatation and systolic dysfunction. Anticoagulation with enoxaparin followed by apixaban led to complete thrombus resolution within 10 days, with regression of right ventricular dilatation and recovery of systolic function.

This case suggests that anticoagulation alone may be effective in carefully selected hemodynamically stable patients, although the optimal management of right heart thrombi remains controversial. Early echocardiographic diagnosis and individualized treatment are essential.

Keywords: Right heart thrombus; Pulmonary embolism; Echocardiography; Anticoagulation; Right ventricular dysfunction.

1 INTRODUCTION

Right heart thrombosis in the absence of atrial fibrillation, structural heart disease, or intracardiac devices is an uncommon clinical entity. It typically corresponds to a thrombus-in-transit, originating from the systemic venous circulation and migrating toward the pulmonary arterial system (1).

The coexistence of right heart thrombus (RHT) and pulmonary embolism (PE) is an life-threatening emergency (2). The prevalence of right heart thrombus in patients with pulmonary embolism is 4%–18% (3). Most are in the right atrium (4).

Right atrial or right ventricular thrombi that are adherent to the endocardial surface are generally associated with a better prognosis (4). In contrast, free-floating, serpiginous thrombi are typically linked to massive, hemodynamically unstable pulmonary embolism and are associated with an increased risk of mortality (5).

No consensus exists regarding the optimal management of pulmonary embolism complicated by free-floating right heart thrombi. Reported treatment strategies include anticoagulation with heparin, systemic thrombolysis, surgical embolectomy, or percutaneous catheter-directed thrombectomy. (6).

2 CASE PRESENTATION

2.1 Patient information

A 57-year-old obese woman with a history of cholecystectomy performed 40 days before admission presented to the emergency department with a 3-day history of progressively worsening dyspnea at rest associated with dizziness, without chest pain or syncope.

2.2 Clinical findings

On admission, the patient was hemodynamically stable, with a blood pressure of 142/85 mmHg and a heart rate of 104 beats/min. She was afebrile. Her respiratory rate was 26 breaths/min, with an oxygen saturation of 86% on room air. The remainder of the physical examination was unremarkable.

2.3 Diagnostic assessment

Given the clinical suspicion of pulmonary embolism (PE), the Geneva and Wells scores were calculated and indicated an intermediate clinical probability. Laboratory investigations revealed markedly elevated D-dimer levels (19,510 $\mu\text{g/L}$), prompting computed tomography pulmonary angiography (CTPA).

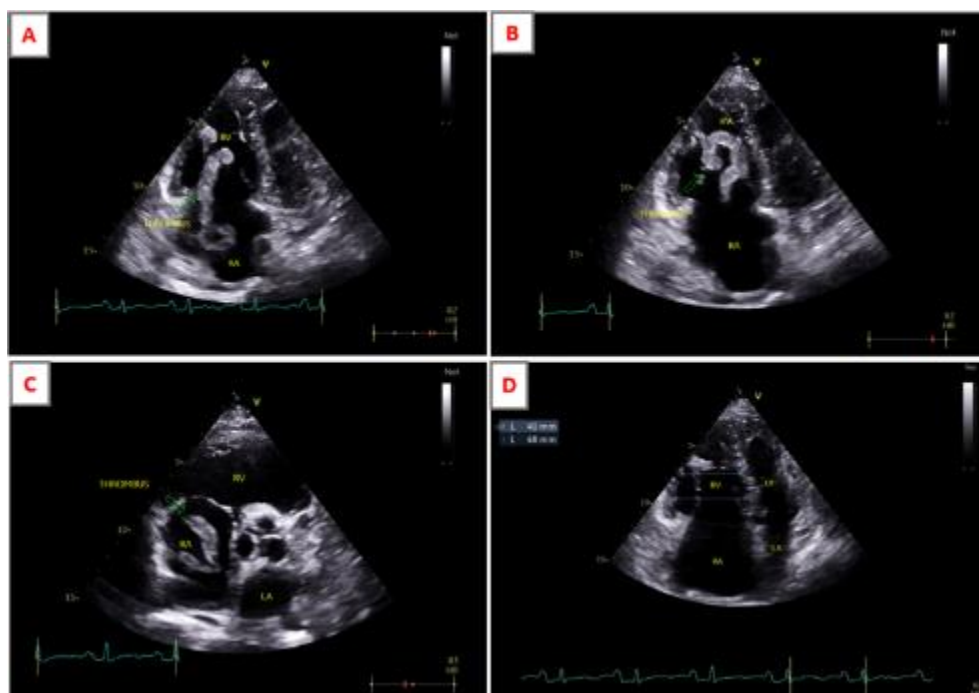


Figure 1: Transthoracic echocardiography (TTE) images: A and B: Apical four-chamber views showing a serpiginous thrombus in transit between the right atrium (RA) and right ventricle (RV). C: Parasternal short-axis view at the level of the aortic valve showing the thrombus within the right atrium. D: Apical four-chamber view demonstrating marked right ventricular dilatation, with a basal diameter of 48 mm and a mid-cavity diameter of 40 mm.

CTPA confirmed acute pulmonary embolism involving the pulmonary trunk and showed peripheral wedge-shaped subpleural consolidations consistent with pulmonary infarction.

Transthoracic echocardiography (TTE), performed for risk stratification, showed preserved left ventricular systolic function and revealed a large, highly mobile, serpiginous thrombus freely floating within the right atrium and prolapsing into the right ventricle during diastole, consistent with a right heart thrombus in transit. The right-sided cardiac chambers were dilated, with evidence of right ventricular systolic dysfunction. [Figure 1].

Further laboratory evaluation demonstrated elevated cardiac biomarkers, with an NT-proBNP level of 5,527 pg/mL and a high-sensitivity cardiac troponin (hs-cTn) level of 47 ng/L (reference range: 2–16 ng/L), while hepatic and renal function and serum electrolyte levels were within normal limits.

Despite preserved hemodynamic status, the presence of right ventricular systolic dysfunction together with elevated cardiac biomarkers was consistent with an intermediate-high-risk pulmonary embolism, warranting close hemodynamic monitoring.

Lower-limb Doppler ultrasonography revealed partial thrombosis of the left popliteal vein. The coexistence of deep vein thrombosis and the characteristic highly mobile, serpiginous morphology of the right atrial thrombus strongly supported its venous origin and the diagnosis of a thrombus in transit.

2.4 Diagnosis

The final diagnosis was acute intermediate-high-risk pulmonary embolism associated with a free-floating right atrial thrombus in transit and left popliteal deep vein thrombosis.

2.5 Therapeutic intervention

Given the patient's hemodynamic stability, neither systemic thrombolysis nor surgical thrombectomy was pursued. Therapeutic anticoagulation with low-molecular-weight heparin was initiated, followed by oral anticoagulation with apixaban at a dose of 10 mg twice daily for 7 days and subsequently 5 mg twice daily as maintenance therapy.

The patient was closely monitored for any signs of hemodynamic deterioration that would have warranted escalation to reperfusion therapy.

2.6 Follow-up and outcomes

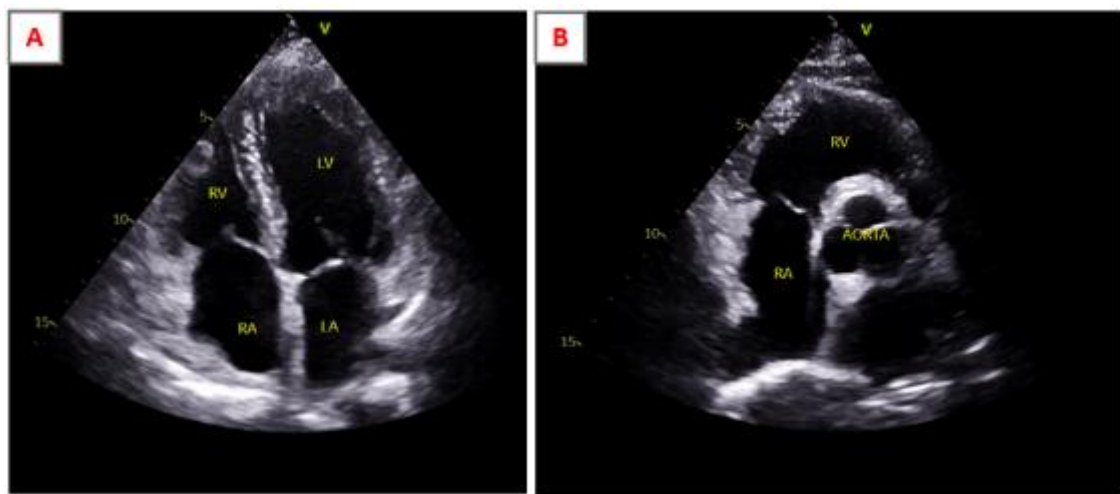


Figure 2: Transthoracic echocardiography (TTE) images after treatment. A: Apical four-chamber view showing complete resolution of the serpiginous thrombus, with normalization of right-sided cardiac chamber dimensions. B: Parasternal short-axis view at the level of the aortic valve confirming complete resolution of the right atrial thrombus.

The clinical course was favorable, with progressive improvement in respiratory symptoms and discontinuation of supplemental oxygen by day 4 of hospitalization.

Follow-up transthoracic echocardiography performed 10 days after initiation of anticoagulation demonstrated complete resolution of the right atrial thrombus, together with regression of right-sided chamber dilatation and recovery of right ventricular systolic function. [Figure 2].

The patient remained hemodynamically stable throughout hospitalization and was discharged on oral anticoagulation with apixaban.

2.7 Patient perspective

The patient reported substantial improvement in her symptoms following initiation of treatment and expressed relief after being informed of the complete resolution of the intracardiac thrombus on follow-up echocardiography. She expressed satisfaction with the favorable clinical outcome and agreed to continued anticoagulant therapy and follow-up.

2.8 Informed consent

Written informed consent was obtained from the patient for publication of this case report and the accompanying clinical images.

3 DISCUSSION

Right atrial masses are uncommon and encompass a broad differential diagnosis, including neoplasms, thrombi, infective vegetations, normal anatomical variants, and imaging artifacts (7). Their differential diagnosis relies on the location and morphological characteristics of the mass, together with the patient's clinical presentation and underlying conditions (8). Accurate characterization is essential, as misdiagnosis may lead to inappropriate therapeutic management.

The European Cooperative Study on the Clinical Significance of Right Heart Thrombi identified two main echocardiographic patterns with distinct morphological, etiological, and prognostic characteristics (9). Type A thrombi are typically long, thin, highly mobile, and serpiginous. They are strongly associated with deep vein thrombosis and are considered thrombi in transit from the peripheral venous circulation. They are frequently associated with severe pulmonary embolism and carry a substantial early mortality risk (9). In contrast, type B thrombi are relatively immobile, resemble left-sided intracardiac thrombi, and generally develop in situ in association with underlying cardiac abnormalities, with a more favorable prognosis (9). A minority of thrombi exhibit intermediate characteristics and cannot be clearly classified.

In our patient, the highly mobile, serpiginous morphology of the right atrial thrombus, its prolapse into the right ventricle during diastole, and the concomitant left popliteal deep vein thrombosis strongly supported its classification as a type A thrombus in transit.

The optimal management of free-floating right heart thrombi remains controversial. Current European guidelines do not provide a specific treatment algorithm for right heart thrombi, although emergency reperfusion therapy is recommended in patients with pulmonary embolism and hemodynamic instability. The 2026 AHA/ACC multisociety guideline considers advanced therapy over anticoagulation alone reasonable in selected patients with free-floating right atrial or right ventricular clot-in-transit; however, the supporting evidence remains limited.

Several therapeutic approaches have been reported, including anticoagulation alone, systemic thrombolysis, surgical embolectomy, and catheter-based interventions. Thrombolysis offers the potential advantages of rapid pulmonary reperfusion and simultaneous treatment of intracardiac, pulmonary, and peripheral venous thrombi, while reducing right ventricular afterload and potentially improving right ventricular function (11). Surgical embolectomy allows direct thrombus removal but entails procedural delays, general anesthesia, and cardiopulmonary bypass. Surgery remains particularly relevant when a thrombus is trapped across a patent foramen ovale because of the risk of systemic embolization.

Available observational data have not established the superiority of one strategy. Chartier et al. (10) found no significant difference in in-hospital mortality among the different therapeutic approaches. Similarly, Barrios et al. (12) compared anticoagulation alone with reperfusion therapy in 325 patients with pulmonary embolism and right heart thrombi. After propensity score matching, pulmonary embolism-related mortality did not differ significantly between anticoagulation and reperfusion therapy (7.8% vs. 4.7%, respectively; $P = .47$). However, the observational and nonrandomized nature of these data limits definitive conclusions, particularly in patients with established hemodynamic instability.

In our patient, despite right ventricular dysfunction and elevated cardiac biomarkers, hemodynamic stability was maintained throughout the initial evaluation. In the absence of shock or persistent hypotension, and after individualized assessment of the risk-benefit balance, anticoagulation alone was selected, with close clinical and echocardiographic monitoring. This strategy resulted in rapid clinical improvement, discontinuation of supplemental oxygen by day 4, and complete resolution of the right atrial thrombus with recovery of right ventricular function within 10 days.

In the absence of robust randomized evidence, management of right heart thrombi should therefore be individualized according to hemodynamic status, right ventricular dysfunction, thrombus morphology and mobility, pulmonary embolism burden, bleeding risk, associated patent foramen ovale, comorbidities, and local expertise. Our case illustrates that anticoagulation alone may achieve a favorable clinical and echocardiographic outcome in carefully selected hemodynamically stable patients with a right heart thrombus in transit, provided that close monitoring and prompt access to rescue reperfusion therapy are available.

4 CONCLUSION

Right heart thrombi associated with pulmonary embolism represent a rare but potentially life-threatening condition associated with substantial diagnostic and therapeutic challenges. Early recognition and careful echocardiographic characterization are crucial for identifying thrombi in transit and distinguishing them from other intracardiac masses. Given the absence of a well-established optimal treatment strategy, management should be individualized according to hemodynamic status, right ventricular involvement, thrombus characteristics, bleeding risk, and the overall clinical context. Our case highlights that anticoagulation alone may result in complete thrombus resolution and favorable right ventricular recovery in carefully selected hemodynamically stable patients. Further prospective studies are needed to better define prognostic factors and establish optimal management strategies for this high-risk population.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Disclosure of conflict of interest

The authors declare no competing interests.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study

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