A 51-Year-Old Man With Right Atrial Neoplasm Presenting With Syncope and Shock

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A 51-year-old man with a history of psychosis for 35 years was admitted to hospital after an unprovoked assault 6 days ago. He had not been taking any medication for nearly 1 year. After admission, he was treated with quetiapine and promethazine, and his mental symptoms improved. On the day 5 of antipsychotic treatment, he lost conscious while resting in bed. After approximately 15 minutes, he regained consciousness, merely complaining dizziness. He was found hypotensive and was transferred to the ICU. At ICU admission, he was alert and oriented, with a heart rate of 103 beats/min, a BP of 102/63 mm Hg with continuous infusion of high-dose vasopressor, a respiratory rate of 28 breaths/min, and an arterial oxygen saturation 90% while breathing through a mask with an oxygen reservoir bag. An immediate arterial blood gas analysis showed arterial oxygen partial pressure of 56 mm Hg. While waiting for the results of other laboratory tests, bedside point-of-care ultrasound (POCUS) scans were performed to determine the cause of syncope and shock. Later, his laboratory tests revealed WBC count of $15.5 \times 10^9/L$, hemoglobin of 129 g/L, platelets of $105 \times 10^9/L$, BUN of 5.52 mM, creatinine level of 78.9 µM, alanine aminotransferase of 772.6 units/L, aspartate aminotransferase of 581.6 units/L, troponin I of 1.93 ng/mL, brain natriuretic peptide of 525.1 pg/mL, D-dimer of 48.2 µg/mL, fibrinogen degradation products of 82.8 µg/mL, and international normalized ratio of 1.06.

Question: What is the major abnormal finding on this apical four-chamber view and what is the cause of it?
**Answer:** There is a massive mass in the right atrium that indicates a series of thrombi.

**Discussion**

In this case, the patient presented with syncope and shock. It is difficult to make a quick diagnosis in such patients in a short time based merely on the clinical presentation and laboratory tests. The application of POCUS immediately identified the cause and facilitated timely management.

On the apical four-chamber view (Video 1), a massive echogenic mass was swirling within the enlarged right atrium, and sometimes some parts of the mass moved forward and backward through the tricuspid orifice. During diastole, the mass obstructed the tricuspid orifice and restricted the blood from flowing into the right ventricle. On the parasternal long axis view, a part of the mass could be seen in the right ventricle outflow tract. On the parasternal short axis view, other than a part of the mass, we witnessed the enlarged right ventricle and D-sign. In addition, severe tricuspid regurgitation was also identified with color Doppler flow imaging. We scanned veins of bilateral lower extremities and inferior vena cava afterwards, but no specific findings were identified.

Cardiac masses comprise benign, malignant, and nontumoral lesions.1 Thrombus and myxoma are the most common in the right atrium, accounting for 44% and 32%, respectively.2 In another study, Attili et al3 stated that, in descending order of likelihood, myxoma, thrombus, metastases, and a primary malignant cardiac tumor cause masses in the right atrium. Echocardiography is a very useful tool for the detection of an atrial mass, and it is also helpful to differentiate the causes of masses to a certain extent, in view of the differences (Table 1). However, for some very similar masses, it is difficult to differentiate merely with the use of transthoracic echocardiography. For example, a pedunculated globular thrombus in both size and shape mimics a myxoma in the right atrium.4 Compared with echocardiography, cardiac MRI is more useful in the identification of the nature of a cardiac mass.3 A trial of anticoagulation may be considered to differentiate between thrombus and myxoma.5 It is useful, especially in patients whose condition is critical who are not able to tolerate cardiac MRI or who have contradictions for MRI, but it may also carry a risk of thrombus travelling and pulmonary artery embolism. Before the initiation of anticoagulation, to detect whether there already is an embolism in any branch of pulmonary artery, the use of CT pulmonary angiography (CTPA) is reasonable. In this patient, thrombi was suspected strongly based on transthoracic echocardiography findings and an elevated level of D-dimer. CTPA demonstrated a significantly enlarged right heart along with multiple thrombi in branches of pulmonary artery (Fig 1), which increases the possibility of a series right atrial thrombi combined with multiple pulmonary embolisms, but it does not preclude the possibility of a tumor combined with pulmonary embolisms.

This patient was treated with ordinary heparin, low-molecular-weight heparin, and alteplase; at the same time, pituitrin, dopamine, and dobutamine were given to maintain hemodynamics. On day 2 of treatment, repeat ultrasound examination demonstrated that the right atrial mass disappeared, but the right ventricle was still enlarged, and the interventricular septum remained flat during systole (Video 2). His oxygen saturation increased gradually, and hemodynamics stabilized. On day 6, a second CTPA revealed that the enlarged right heart was restored and that the pulmonary thrombi decreased significantly (Fig 2). He was discharged from the ICU on day 9.

**TABLE 1** Differences Among Thrombus, Myxoma, and Vegetation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Thrombus</th>
<th>Myxoma</th>
<th>Vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common location</td>
<td>Left atrium, right atrium</td>
<td>Left atrium, right atrium</td>
<td>Valves</td>
</tr>
<tr>
<td>Pedunculated</td>
<td>Uncommon</td>
<td>Almost all</td>
<td>...</td>
</tr>
<tr>
<td>Shape</td>
<td>Lobulated</td>
<td>Rare</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>Globular</td>
<td>Almost all</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>Serpiginous</td>
<td>Possible</td>
<td>...</td>
</tr>
<tr>
<td>Ultrasound patterns</td>
<td>A series of lobulated masses; a globular massive mass</td>
<td>A globular massive mass; a lobulated massive mass</td>
<td>Serpiginous masses</td>
</tr>
</tbody>
</table>

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1. Ultrasound Corner

2. Chest Aug 2021

3. Attili et al

4. Pituitrin, dopamine, and dobutamine were given to maintain hemodynamics.

5. CTPA demonstrated a significantly enlarged right heart along with multiple thrombi in branches of pulmonary artery (Fig 1), which increases the possibility of a series right atrial thrombi combined with multiple pulmonary embolisms, but it does not preclude the possibility of a tumor combined with pulmonary embolisms.

6. This patient was treated with ordinary heparin, low-molecular-weight heparin, and alteplase; at the same time, pituitrin, dopamine, and dobutamine were given to maintain hemodynamics. On day 2 of treatment, repeat ultrasound examination demonstrated that the right atrial mass disappeared, but the right ventricle was still enlarged, and the interventricular septum remained flat during systole (Video 2). His oxygen saturation increased gradually, and hemodynamics stabilized. On day 6, a second CTPA revealed that the enlarged right heart was restored and that the pulmonary thrombi decreased significantly (Fig 2). He was discharged from the ICU on day 9.
Intracardiac thrombi are typically located in the atrium, more often in the left atrium and generally occur in patients with organic heart disease, which includes acute myocardial infarction, cardiomyopathies and myocarditis, left ventricular aneurysm, valve disease and/or prosthesis, and atrial fibrillation. Among patients without organic heart diseases, the incidence of intracardiac thrombosis is generally low. However, the true incidence of intracardiac thrombosis is unclear because most studies have focused on symptomatic embolic events. The causes of intracardiac thrombi include embolic (caused by DVT) and in situ (caused by stagnant blood flow from organic heart disease). In the presented case, given that the patient did not have organic heart diseases, he most likely had embolic intracardiac thrombi. Although DVT was not detected on POCUS, it is possible that the thrombus may have broken off already and embolized to the heart. In our previous case study, actual thrombus was seen within the inferior vena cava moving toward the heart.

An elevated risk of thromboembolic diseases has been linked with increased age and immobility and various disease states and medications. Liperoti et al found that atypical antipsychotic agents, including risperidone, olanzapine, clozapine, and quetiapine, increase the likelihood of VTE among elderly patients. In the presented case, because the middle-age patient did not have physical diseases, the cause of thrombosis was probably attributed to the use of antipsychotics. In addition, genetic causes could not be ruled out completely; however, the family refused to do the relevant examination, so we cannot get evidence.

The presence of concomitant right heart thrombi with pulmonary embolism carries a worse prognosis than pulmonary embolism alone. Depending on hemodynamics, treatment options for voluminous atrial thrombi includes anticoagulants and thrombolytics. Surgical thrombectomy is reserved for patients with contraindications to medical therapy, concomitant cardiac abnormalities, or endocarditis. Of note, the risk of clot burden traveling into the pulmonary vasculature may increase after thrombolysis. There have also been case reports of...
patients whose condition deteriorated after thrombolysis.  

Right atrium thrombus is a cardiac emergency that requires prompt diagnosis and treatment. The present case highlights the importance of POCUS in the initial evaluation of patients in critical condition. Although CTPA and cardiac MRI are still important, POCUS increasingly is considered as an essential bedside diagnostic tool because of its advantages, because it is noninvasive, relatively inexpensive, readily available, and portable and provides real-time results; therefore, it provides an immediate and presumptive diagnosis, which may lead to rapid decisions.

Reverberations

1. **Right atrial masses are not common, but they may be fatal.**

2. **Echocardiography is a very useful tool in the detection of the atrial mass and helpful with the differentiation of the causes of masses to a certain extent.**

3. **Antipsychotic use is associated with the development of thromboembolic diseases. Patients who have been taking antipsychotics should be highly alert for the occurrence of thromboembolism.**

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Additional information: To analyze this case with the videos, see the online version of this article.

References


