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CASE REPORT

Elongated Inferior Vena Cava and Intracardiac Mass: Thrombus In-Transit or Metastasis - A Case Report

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ABSTRACT

Cardiac masses are rare entities categorized as either neoplastic or non-neoplastic. We present a case of cardiac mass from the inferior vena cava (IVC) extending to the right atrium, right ventricle and pulmonary artery that was diagnosed by computed tomography (CT), transthoracic echocardiography (TTE), and cardiovascular magnetic resonance (CMR) imaging. Differential diagnosis of a right atrial mass includes myxoma, thrombus, renal cell carcinoma and metastatic cardiac tumor. This case emphasizes the importance of multi-modal imaging during diagnostic work-up when a cardiac mass of unknown origin is present.

KEYWORDS

Cardiac masses; Transthoracic echocardiography; Metastatic cardiac tumor; Pulmonary artery

INTRODUCTION

The incidence of multiple intracardiac masses is rare. The differential diagnosis of intracavitary cardiac mass includes benign, malignant primary, secondary metastatic cardiac tumors, or thrombus [1]. Here, we present a case of an intracardiac mass that was found to extend from the IVC into the right atrium (RA), through the tricuspid valve (TV) into the right ventricle (RV) and into the pulmonary outflow tract and main pulmonary artery (PA). We share our experience in diagnostic approach to an intracardiac mass and the possible differential diagnoses.

CASE PRESENTATION

The patient is a 61-year-old female with no past medical history, presented to the emergency department (ED) after her outpatient echocardiogram revealed a large mass originating in the IVC extending into the RA, RV and PA (Figure 1 and Figure 2). Her left ventricular function was normal with an ejection fraction of 68%. She had severe tricuspid regurgitation and pulmonary artery hypertension with an estimated right ventricular systolic pressure of 66 mmHg. She was in her usual state of good health except for two seizure and near syncopal episodes

earlier this year. She had unremarkable workup and took a short course of levetiracetam. She denied any history of COVID pneumonia and was vaccinated against SARS-CoV-2 (Pfizer).

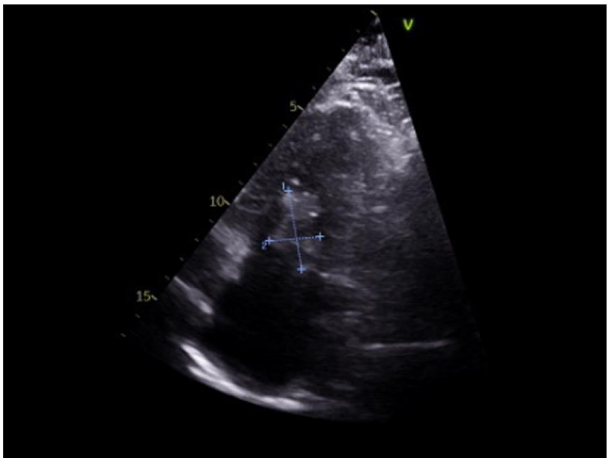

Figure 1: Apical four-chamber view demonstrates 3.3 cm by 2.1 cm mass entering the right ventricle during diastole.

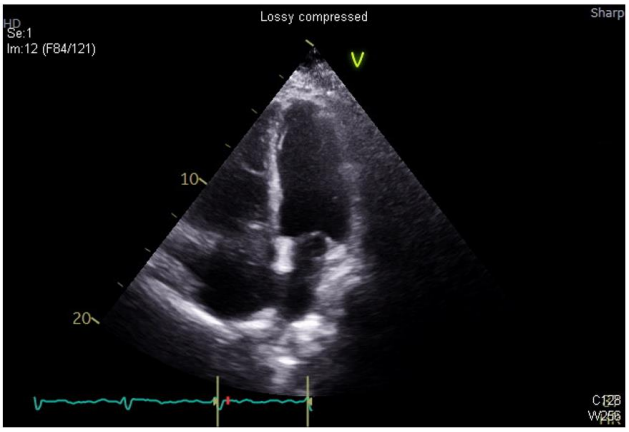

Figure 2: Apical four-chamber view shows intracavitary cardiac mass entering the right atrium during systole.

In the ED, her vitals were blood pressure 170/72 mmHg and pulse rate 87 beats/minute. The patient had no jugular venous distention, and normal breath sounds were equal throughout all lung fields. Her cardiac examination revealed regular rate and rhythm with an audible systolic (4/6) murmur. No palpable mass was detected in her neck, axillary or inguinal regions. Her lower limbs did not show any evidence of edema. Biochemistry test results did not reveal renal insufficiency (creatinine 0.69 mg/dL). Serial troponin was subsequently negative. Of note, her D-dimer was also negative (0.49 mg/L). The patient's electrocardiogram showed normal sinus rhythm. Chest radiography showed no acute cardiopulmonary disease. There was no deep vein thrombosis detected on her lower extremity venous doppler. CT angiogram of chest showed a filling defect extending from the IVC into the RA, through the TV into the RV and PA (Figure 3). These findings raised suspicion of renal cell carcinoma which prompted an urgent CT of abdominal and pelvis, which revealed heavy clot burden in the right external iliac vein through the common iliac vein. The patient was admitted to the intensive care unit (ICU) for further evaluation and management.

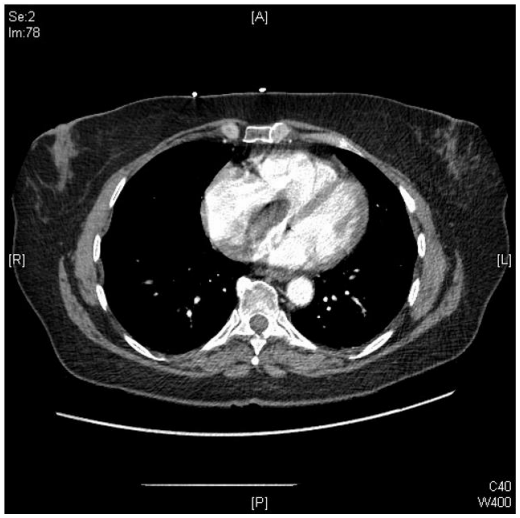

Figure 3: CT angiogram of the chest demonstrates filling defect in the right atrium and right ventricle, representing intracardiac mass.

Systemic heparinization was initiated promptly, and hypercoagulable workup and hematology consultation were obtained. The patient was further closely monitored in the ICU for an additional 24 hours for hemodynamic stability prior to being downgraded to the medical floor. A follow-up echo was done on hospital day (HD) three and showed a large, irregular, mobile mass in the IVC and dilated RA and RV (Figure 4). Left ventricular ejection fraction was estimated in the range of 60% to 65%. She had moderate tricuspid regurgitation and worsening pulmonary artery hypertension with an estimated right ventricular systolic pressure of 78 mmHg. A CMR was done on HD five and demonstrated a large, elongated mass extending from the IVC into the RA, RV and main pulmonary artery (Figure 5 - Figure 7). These finding favours tumor over thrombus because of its appearance and late gadolinium enhancement. Cardiothoracic surgery team was consulted and recommended non-operative management. Interventional cardiology team attempted angiovac procedure on HD seven yet unable to obtain any cells on specimen. At this time, initial hypercoagulable work up showed no identifiable etiology as she tested negative for Factor V Leiden mutation as well as proteins C and S activity. Currently, the patient was being evaluated for possible endomyocardial biopsy, comprehensive hypercoagulable workup and higher level of care.

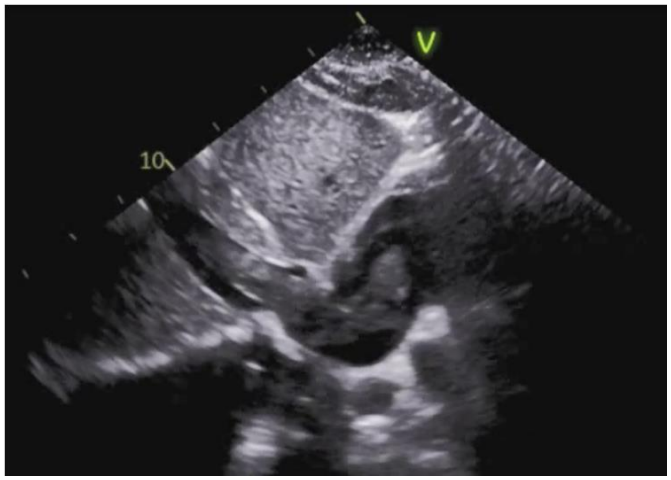

Figure 4: Subcostal view focuses on inferior vena cava (IVC) reveals elongated mass within the IVC and extending into the right atrium.

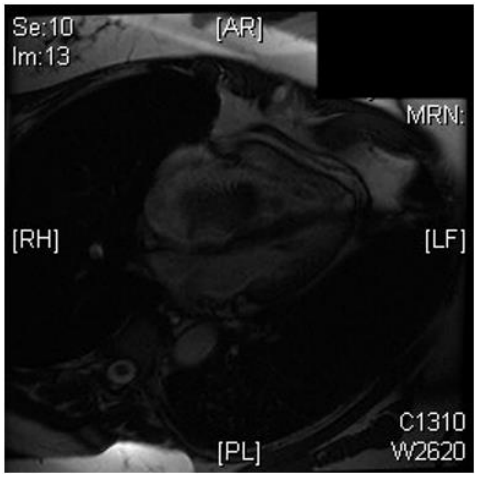

Figure 5: Cardiac magnetic resonance imaging demonstrates intracardiac mass crossing the plane of tricuspid valve.

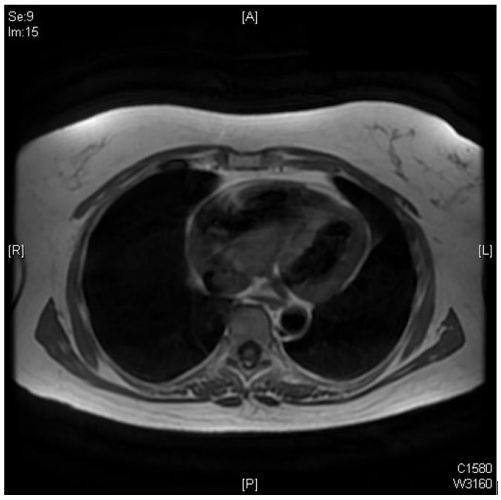

Figure 6: Cardiac magnetic resonance imaging shows intracardiac mass exhibiting the same density as adjacent cardiac tissues.

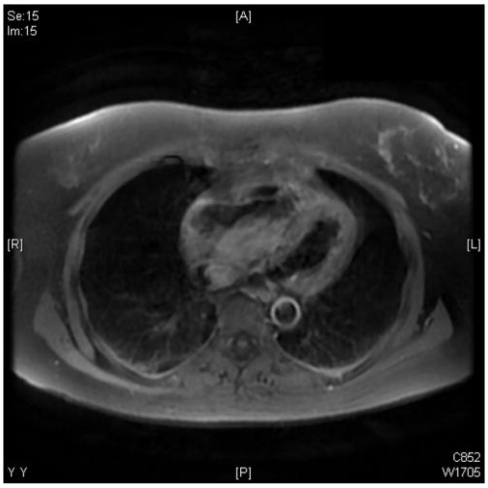

Figure 7: Cardiac magnetic resonance imaging shows intracardiac mass with gadolinium uptake, favouring mass over thrombus.

DISCUSSION

Cardiac masses are uncommon findings and can be categorized as either neoplastic or non-neoplastic. Of all primary cardiac tumors, approximately 75% are benign, with myxoma accounting for at least half of reported

cases [2]. Non-neoplastic cardiac masses, such as thrombi, pericardial cysts, and prominent anatomic structures, can often mimic cardiac tumors, leading to diagnostic challenges [3].

The classic triad found in patients with cardiac tumor is obstruction of blood flow, constitutional symptoms and thromboembolic events [4,5]. Our patient did not endorse any pulmonary or cardiac symptoms. Her neurological symptoms of near syncope and seizure episodes did not seem to be related to her present illness. She had no risk factors for venous thromboembolism, including hormone therapy, prolonged car or plane ride, or receiving the Johnson and Johnson COVID vaccine.

Clinical imaging is the next step in investigating the etiology of an intracardiac mass after taking a thorough history. Imaging modalities such as CT and CMR can provide additional information when echocardiography cannot delineate the extent of myocardium involvement. This is significant to our patient's case as the CT showed a linear focus within IVC, which raised the possibility of a tumor thrombus versus an intravascular mass. T1 image and post-gadolinium enhancement offered further differentiation between tumor and thrombi [4-10]. Her CMR favoured the diagnosis of tumor because the mass showed bright coloration after contrast gadolinium administration.

Intracardiac masses can also arise from an extension through the inferior or superior vena cava [6]. Although most of these cases in the vena cava are thrombi related to intravascular access devices, blood clots in these areas can also develop from tumor invasion from intraabdominal malignancies, namely renal cell, adrenal, and hepatocellular carcinomas [7]. It was crucial to obtain contrasted CT of abdomen and pelvis to investigate these possible etiologies. In our patient, her mass in the RA and IVC was neither related to a renal tumor nor indwelling vascular access. Therefore, it was probably a deep vein thrombosis of the right external iliac vein developed from her intracardiac tumor.

Treatment of presumed thrombus in-transit includes conservative medical management with systemic anticoagulation using heparin. Other options for treatment include surgical embolectomy with exploration of the atria and thrombolysis [8]. The mortality related to untreated right atrial thrombus is around 40%, primarily related to pulmonary embolus [9]. For our patient, we referred her to comprehensive center for hypercoagulable workup. We elected systemic anticoagulation for her right external iliac vein thrombosis and transferred her to another hospital for endomyocardial biopsy of her intracardiac mass.

CONCLUSION

In conclusion, asymptomatic intracavitary cardiac masses are rare occurrence. They prompt careful differentiation between malignancy and thrombus through history taking and multi-modal clinical imaging. Sometimes, both thrombus and tumor are present concurrently. CMR is helpful when endomyocardial biopsy is not readily available during the initial treatment phase. Referring patients to comprehensive care centres may improve further diagnostic yield through team approach.

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