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CASE OF THE ISSUE

The case of the disappearing myxoma

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We present a case demonstrating the utility of cardiovascular magnetic resonance (CMR) in the diagnosis of a cardiac mass. A 70-year-old female who presented with chest pressure and left sided jaw pain was found to have a cardiac mass on transthoracic and transesophageal echocardiography that was diagnosed as an atrial myxoma. A cardiac magnetic resonance test determined the mass to be more consistent with a thrombus than a myxoma through a stepwise approach using multiple pulse sequences. Thus, unwarranted and potentially risky thoracic surgery was avoided by the incorporation of a systematic evaluation by cardiac MRI.

1. Case history

A 70-year-old female with hypertension and paroxysmal atrial fibrillation, requiring coumadin, presented to the emergency department complaining of left-sided jaw pain, sub-sternal chest pressure, and dizziness. Her vital signs were within normal limits, and her physical exam was significant only for an S4. Her presenting electrocardiogram revealed no evidence of ischemia. Her INR on admission was sub therapeutic (1.8). Her cardiac enzymes were elevated (peak CK-MB 39 ng/mL), and the patient underwent cardiac catheterization. She had inferior wall hypokinesis and 50% stenosis of the left main coronary artery, but no other epicardial coronary artery disease. A transthoracic echocardiogram (TTE) was also performed and confirmed the inferior wall hypokinesis with an ejection fraction of 50%, and a left atrial mass was observed. Transesophageal echocardiogram (TEE) supported the diagnosis of a cardiac mass (Fig. 1-E). Prior to surgery, the patient underwent cardiac magnetic resonance imaging (MRI) (Fig. 1 A–D).

By cardiac MRI, the mass was seen as more consistent with thrombus than a myxoma. Because of the patient's other comorbidities and findings on MRI, surgery was postponed. The patient was discharged with strict adherence to coumadin for 3 months. Follow up MRI performed 3 months later revealed complete resolution of the mass, and there were no findings to suggest embolization.

This case nicely demonstrates the difficulty clinicians have in differentiating between tumor and thrombus given current diagnostic tools. A stepwise approach utilizing cardiac MRI can often be quite useful in making this distinction. The systematic approach we propose entails the following: 1) Evaluation of the mass in relation to the motion of the heart by cine MRI (True FISP); 2) Characterization of the tissue and exclusion of the lipoma by T1 and T2 turbo spin echo (TSE) with and without fat saturation; 3) Assessment of the mass vascularity by Saturation Recovery Gradient Refocused Echo (SR-GRE) perfusion; 4) Assessment of both the inversion time needed to null the mass and to evaluate the hyper-enhancement pattern by the Inversion Recovery- (IR-GRE)-delayed enhancement sequence.

In this case, the cine MRI revealed a mass on the ridge between the left atrial appendage and the left upper pulmonary vein (Fig. 1A). The T1 and T2 weighted TSE with and without fat saturation revealed a iso- and hyper-intensity respectively of the mass relative to the myocardium and excluded fat. The perfusion sequence showed no contrast uptake of the mass confirming it as avascular. The inversion time on the delayed enhancement imaging found a TI of 700 ms to null the mass, consistent with thrombus rather than tumor, and there was no evidence of heterogeneous hyper-enhancement, which is often seen with myxomas. Therefore, a diagnosis of thrombus was made by cardiac MRI.

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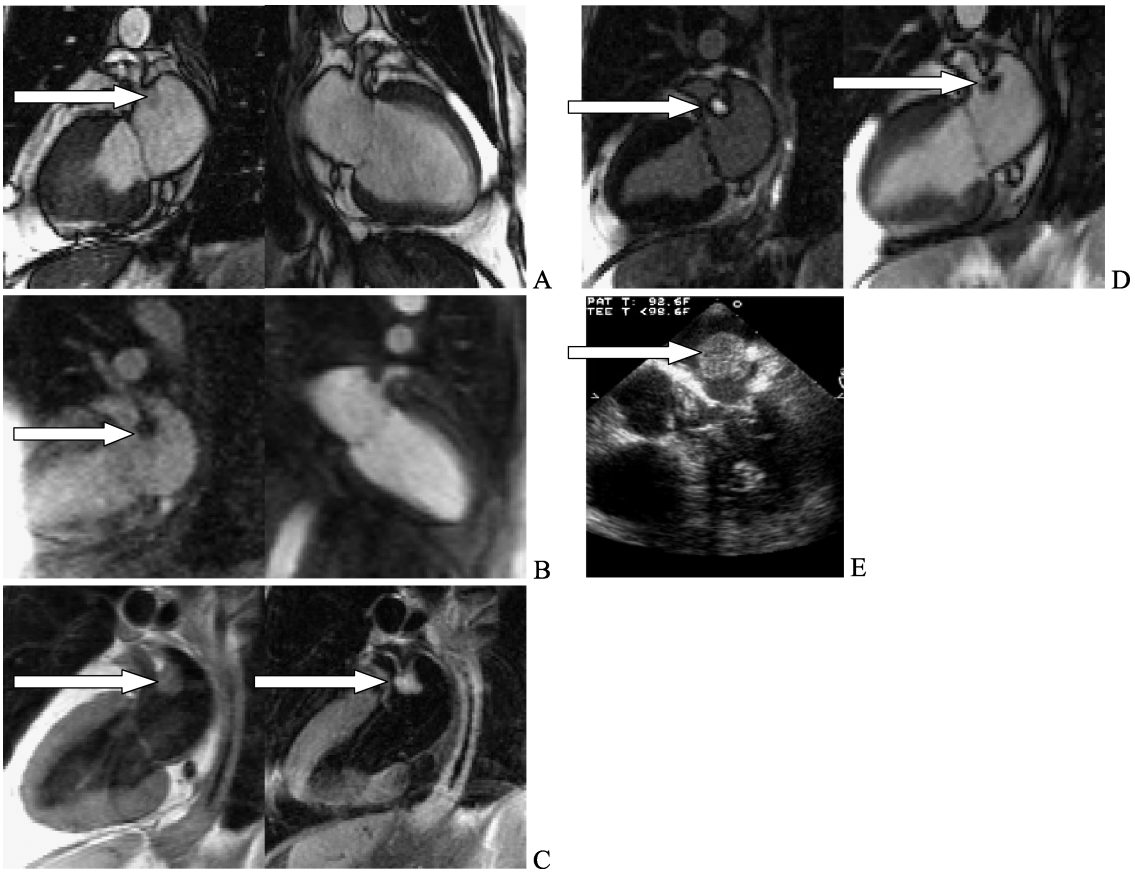

Figure 1. A) A 2 chamber view of the left ventricle and left atrium by cine True FISP MRI pre and post coumadin treatment, respectively (thrombus-arrow). B) SR-GRE perfusion sequence with contrast pre and post coumadin, respectively. C) T1 and T2 weighted turbo spin echo, respectively, of the left atrial thrombus, pre-coumadin. D) IR-True FISP post contrast with an inversion time of 300 and 700 ms, respectively pre-coumadin. E) TEE pre-coumadin.

2. Discussion

Primary tumors of the heart are quite rare but myxomas do account for 42 percent of these tumors followed by rhabdomyomas (1). In fact, a cardiac mass is 30–40 times more likely to be a metastatic tumor (2). Cardiac myxomas arise in the left atrium approximately 75% of the time, usually attaching to the inter-atrial septum at the border of the fossa ovalis. Although the MRI literature usually describes masses by their T1 and T2 weighted characteristics, some recent reports evaluate myxomas by cine gradient refocused echo and by delayed hyper-enhancement pattern (3, 4). Thrombus has also recently been reported with the use of MRI by both T1, T2 spin echo characteristics and by delayed enhancement sequences (5, 6). We describe a comprehensive cardiac MRI exam utilizing all of these sequences to optimize the information available by MRI technology in characterizing the nature of cardiac masses (Table 1).

In the assessment of cardiac masses, we found the above stepwise approach to be useful in distinguishing thrombus

Table 1. Appearance of different types of masses on MRI

	TSE T1	TSE T2	Perfusion	Inversion time	Hyperenhancement	Fat saturation
Thrombus	Isointense	Hypointense	Absent	$\approx$ 700 ms	Absent (can sometimes have on outside rim of thrombus)	Absent
Myxoma	Hypo or isointense	Hyperintense	Present	< 450 ms	Heterogeneous pattern	Absent
Lipoma	Hyperintense	Iso or Hyperintense	Absent	< 300	Absent	Present

from tumor. After using cine True FISP and T1 and T2 TSE for localization and characterization, perfusion imaging helps distinguish vascular from avascular masses. Following perfusion imaging, IR True FISP single shot pulse sequence is helpful in determining the inversion time of the mass. Thrombus tends to have a prolonged inversion time, (i.e., greater than 600 ms) and tumor, typically has a shorter inversion time, (i.e., less than 500 ms). Thrombus generally does not enhance on delayed enhancement imaging; however, we have found that in some cases the surface of the thrombus can take up contrast. This may be due to relatively new formed thrombus. Most tumors have heterogenous enhancement on delayed enhancement imaging. Fat sat is useful in ruling out lipomas. As we find in this case, unwarranted and potentially risky thoracic surgery may be avoided by the incorporation of this systematic evaluation by cardiac MRI.

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