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# MULTIMODALITY IMAGING OF GIANT PROLAPSING LEFT ATRIAL MYXOMA

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## ABSTRACT

Through a case of a very large left atrial myxoma diagnosed in a 53-year-old woman, we feature the complementary value of multimodality imaging. Two-dimensional echocardiography continues to be the principal imaging modality for intracardiac masses due to its accessibility and ability to provide basic information on mass morphology, position, and mobility. Real-time three-dimensional echocardiography offers more precise assessment of tumor size and attachment. Cardiac magnetic resonance allows superior tissue characterization, particularly important in differentiating a myxoma from a thrombus. Appropriate use of these various non-invasive imaging modalities is a safe and comprehensive preoperative diagnostic approach for patients with intracardiac masses.

## Case Report

A 53-year-old woman presented with a 6-month history of fever of unknown origin accompanied by weight loss, fatigue, and exertional dyspnea. Medical history was unremarkable. On cardiac auscultation, there was an audible "plop" in the mitral area that raised the suspicion of an intracardiac mass. Transthoracic two-dimensional (2D) echocardiography (iE33, Philips, Andover, MA, USA) revealed a very large, mobile, echogenic mass with smooth borders measuring 5.4 x 3.5 cm filling essentially the entire enlarged left atrium and prolapsing into the left ventricle during diastole (Figure 1A). Mild mitral regurgitation and normal left ventricular ejection fraction were also noted. Real-time three-dimensional (RT3D) echocardiography provided enhanced spatial resolution of the mass and showed that it was attached to the interatrial septum but not to the mitral valve (Figure 1B). Cardiac magnetic resonance (CMR) imaging (1.5 Tesla, Siemens Avanto, Erlangen, Germany) using a Steady State Free Precession (SSFP) cine sequence corroborated the size of the mass and demonstrated heterogenous signal intensity with a sessile attachment to the septal wall

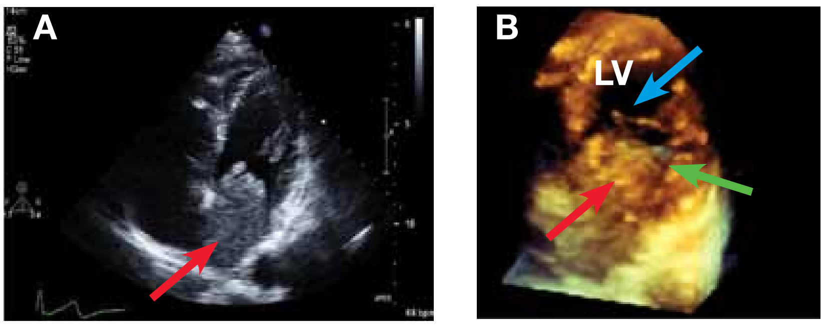


**Figure 1.** A) 2D echo revealed a 5.4 x 3.5 cm mobile, echogenic mass (red arrow) with smooth borders filling the enlarged left atrial cavity and prolapsing into the left ventricle during diastole. B) Live, 3D-echo, full-volume acquisition was cropped to reveal near-complete obstruction of the mitral annulus (green arrow; blue arrow: posterior mitral leaflet). 3D imaging also provided enhanced depth and spatial resolution of the mass. (LV = left ventricle).

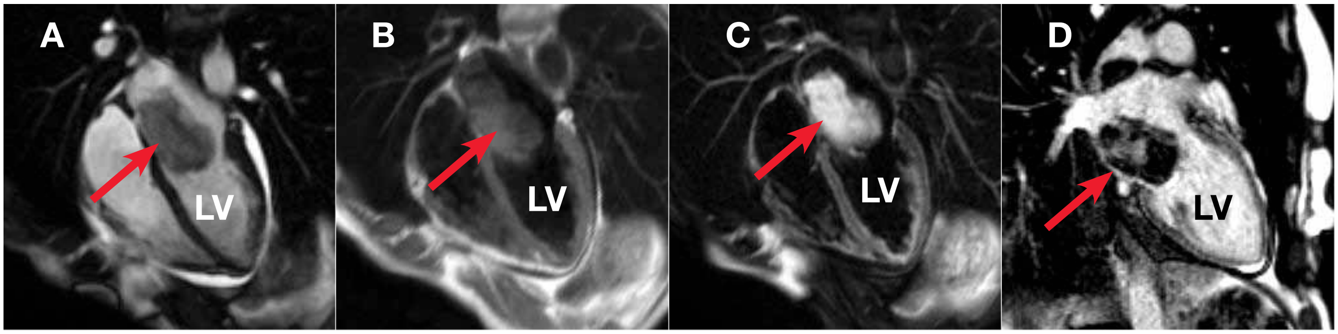


**Figure 2.** A) Steady state free precession cine sequence demonstrated heterogenous signal intensity with a sessile attachment to the septal wall. B) The mass was isointense to myocardium on T1-weighted spin-echo imaging and C) was hyperintense to myocardium on T2-weighted spin-echo with fat suppression. D) Areas of delayed hyperenhancement were seen on post-gadolinium contrast imaging. (red arrow: mass; LV: left ventricle).

(Figure 2A). The mass was isointense to myocardium on T1-weighted spin-echo imaging (Figure 2B) and was hyperintense to myocardium on T2-weighted spin-echo with fat suppression (Figure 2C). First perfusion imaging demonstrated hypovascularity of the mass in relation to normal myocardium. Finally, there were areas of delayed hyperenhancement on post-gadolinium contrast imaging (Figure 2D). These imaging features virtually excluded the presence of thrombus and indicated that the most likely etiology is a benign myxoma. No obstructive coronary artery disease was found on coronary angiography.

In the operating room, a sternal-sparing right minithoracotomy approach was performed by establishing entry inferior and lateral to the right breast. The patient was placed on cardiopulmonary bypass after cannulation of the superior vena cava and aorta. Upon dissection of the interatrial groove, a patent foramen ovale was incidentally detected as the tip of the venous cannula slipped through the right superior pulmonary vein and into the left atrium. The patient was temporarily weaned off of cardiopulmonary bypass to achieve double venous cannulation. On exploration of the left atrium, it was initially visualized that the giant myxoma had a wide sessile attachment to the anterior interatrial septum and the left atrial free wall. After a generous septectomy, however, it became evident that it was attached to the left atrial aspect of the patent foramen ovale. Owing to its size, the mass had to be carefully excised in several portions. Thorough irrigation of the left ventricular cavity was then performed, followed by removal of debris, and closure of the the atrial septal defect using a bovine pericardial patch. Gross pathological and histological specimens of the mass were consistent with a benign myxoma (Figure 3). The patient had an uneventful post-operative course.


**Figure 3.** Gross specimen of excised giant left atrial myxoma.

## Comment

While atrial myxoma is the most common primary cardiac tumor, its presentation as fever of unknown origin is rarely reported.[1] Typically, patients experience at least one or a combination of the classic triad of symptoms: intracardiac obstruction, embolic phenomena, or a constellation of non-specific constitutional symptoms. On physical examination, an audible tumor plop is documented in only about 15% of patients.[2]

Two-dimensional echocardiography remains the primary imaging modality for intracardiac neoplasms, including myxomas. Attachment to the interatrial septum via a narrow stalk, mobility, and distensibility are distinguishing echocardiographic features of a myxoma;[3] however, tissue heterogeneity may be variable.[4] Real-time 3D echocardiography allows both diameter and volumetric measurements of cardiac structures across any number of axes, with high reproducibility. Images may also be cropped on any plane of interest, which is ideal for visualization of specific structures such as tumor attachment. One study reported that 2D echocardiography underestimates left atrial tumor size by approximately 20-25% when compared with RT3D measurements.[5] Since tumor size impacts embolic risk assessment and surgical decision making, routine use of RT3D imaging provides additional value in accurate evaluation of intracardiac mass dimensions.

Cardiac magnetic resonance imaging offers the advantage of superior tissue discrimination in addition to providing multi-planar views of tumor anatomy and vascularity.[6] As demonstrated in this case, it can differentiate a myxoma from a thrombus, its most common differential diagnosis. Mixed areas of calcification, hemorrhage, and necrosis result in a heterogenous tissue appearance.[6] Due to the higher extracellular water content in their matrix, myxomas exhibit low signal intensity in T1-weighted images and high signal intensity in T2-weighted images. On the other hand, because of their high vascularity, myxomas show heterogenous, delayed hyperenhancement after gadolinium contrast on images with short inversion time. In contrast, avascular thrombi will appear hypointense on delayed enhancement inversion recovery images with a long inversion time.[7] As a complementary imaging tool to echocardiography, particularly when images are technically suboptimal, CMR provides information on tumor anatomy, tissue characteristics, and vascularity that has been shown to improve pre-operative planning and surgical outcomes.[8]

## References


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