

Point-of-Care Ultrasound Diagnosis of a Giant Left Atrial Mass



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INTRODUCTION

With the advent of portable ultrasound machines, point-of-care ultrasound (POCUS) is increasingly used as part of the initial clinical workup. In the hands of appropriately trained providers, POCUS can augment clinical decision-making.^{1,2} A recent study showed that POCUS helped confirm the suspected diagnosis in up to 50% of cases and supported a change in the initial diagnosis in 23% of cases.³ We present an emergent case of a giant left atrial (LA) mass identified on POCUS in a patient presenting to the emergency department (ED) with acute limb ischemia.

CASE PRESENTATION

An 83-year-old man presented to the ED with acute bilateral lower extremity paralysis. The patient's medical history was significant for coronary artery disease, hypertension, hyperlipidemia, and gastroesophageal reflux disease. He previously had an out-of-hospital cardiac arrest due to ventricular fibrillation in the setting of acute myocardial infarction for which he underwent stenting of the right coronary artery and implantation of a single-chamber automatic implantable cardioverter-defibrillator (AICD). Initial vital signs revealed a blood pressure of 122/68 mm Hg, a heart rate of 88 beats per minute with a regular rhythm, and a respiratory rate of 28 breaths per minute with an oxygen saturation of 89% on ambient air. Physical examination was remarkable for extensive skin mottling and absent pulses in the lower extremities.

A POCUS study was performed using a Mindray TE7 ultrasound system (Mindray North America, Mahwah, NJ) to assess blood flow in the aorta, and a subcostal cardiac 4-chamber view was obtained, which showed a giant LA mass (Figure 1, Video 1). The mass was obstructing the left ventricular (LV) inflow on two-dimensional images, which demonstrated limited forward flow with poor-quality continuous-wave Doppler spectrum (Figure 2). The LV systolic function was severely impaired, with an estimated LV ejection fraction of 15% to 20%. The right ventricular systolic function was also

severely impaired. Computed tomography angiography (CTA) of the chest, abdomen, and pelvis subsequently revealed total occlusion of the abdominal aorta below the renal arteries (Figure 3) and a large LA mass (Figure 4). Based on these findings, a comprehensive transthoracic echocardiogram (TTE) was performed. This demonstrated a highly mobile heterogeneous echogenic mass (5 × 5 × 9 cm) filling most of the LA and prolapsing into the LV during diastole (Figure 5A, Video 2). The mass appeared attached to the interatrial septum without an obvious stalk (Video 3). Severe global hypokinesis with regional variability was also noted. An AICD lead was seen in the right heart, and the tricuspid regurgitation was estimated as mild to moderate in severity. An ultrasound-enhancing agent (UEA) was administered to better characterize the mass, and perfusion was consistent with partial vascularity (Figure 5B, Video 4). The CTA and TTE findings were highly suggestive of a LA myxoma. However, a concomitant thrombus could not be excluded.

Despite initiation of emergent dialysis in preparation for revascularization, the patient succumbed to multiorgan failure and death within hours of admission to the intensive care unit. Cardiac autopsy confirmed the diagnosis of LA myxoma with surface thrombus (Figure 6A). Protein kinase A type I-alpha regulatory subunit (PRKAR1A) immunohistochemistry revealed loss of staining in the cells of interest (Figure 6B), suggesting a possible PRKAR1A mutation. Given the loss of antigenic PRKAR1A expression on immunohistochemistry, the decedent's blood was tested for PRKAR1 gene mutation by molecular genetic sequencing with no mutation identified.

DISCUSSION

We describe a case of bilateral acute limb ischemia resulting in paralysis. Acute arterial occlusion from acute thrombosis of an atherosclerotic artery, acute arterial dissection, direct trauma, or embolus from a proximal source was the most likely etiology. Rapid cardiac POCUS in the ED provided crucial information and enabled the diagnosis of acute arterial occlusion and detection of a LA myxoma as a potential source for an embolus, resulting in prompt vascular surgery consultation for revascularization. It further provided vital information regarding cardiac function. The differential diagnosis for the LA mass noted on cardiac POCUS included a LA myxoma, lipoma, hemangioma, sarcoma, metastasis, or atrial thrombus.⁴ Subsequent multimodality imaging including a comprehensive TTE and computed tomography (CT) in our patient helped diagnose a LA myxoma, which was later confirmed on histology.

Primary cardiac neoplasms are rare, with a prevalence of up to 0.03%, with cardiac myxomas (CMs) being the most common subtype.⁵ Up to a third of patients may be asymptomatic at the time of their diagnosis, but CM can cause a constellation of cardiac, embolic, and/or constitutional symptoms.⁵ Cardiac symptoms such as

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Conflicts of Interest: None.

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VIDEO HIGHLIGHTS

Video 1: Point-of-care ultrasonography showing a large hyperechoic mass in the left atrium. The AICD lead is seen in the right heart.

Video 2: Transthoracic para-apical 4-chamber view showing a highly mobile heterogeneous mass (5 × 5 × 9 cm) attached to the interatrial septum without an obvious stalk, severe biventricular enlargement with reduced systolic function, and an AICD lead within the right atrium. Solid smooth components mixed with mobile irregular components are seen.

Video 3: Transthoracic parasternal short-axis view at the level of the aorta and left atrium showing a large LA mass occupying most of the left atrium.

Video 4: Transthoracic para-apical 4-chamber view following the administration of a UEA showing partial enhancement of the LA mass, consistent with a myxoma. The UEA separates the tissues of the mass with nonperfused mobile component (dark; presumed clot) and partially perfused solid, smooth component (less bright than blood pool; presumed myxoma).

View the video content online at www.cvcasejournal.com.

dyspnea, palpitations, or syncope arise from the CM obstructing circulation, prolapsing across the valve, or damaging the valvular apparatus.⁶ Embolic symptoms occur due to embolization of CM fragments or surface thrombi. Left-sided CMs are at a higher risk of embolization due to the presence of atrial fibrillation, irregular tumor surface, increased tumor size (>25 mm²), and increased LA diameter associated with increased embolization risk.⁷ Constitutional symptoms such as fatigue are thought to arise from myxomas producing cytokines, such as interleukin-6.⁸ The majority of CMs are sporadic, with up to 10% of cases developing as part of Carney complex,⁹ a rare X-linked dominant multiple neoplasia syndrome caused by inactivating mutations in the PRKAR1A gene and characterized by cardiac and extracardiac myxomas.⁹



Figure 1 Subcostal 4-chamber view acquired with point-of-care ultrasound showing a large left atrial mass prolapsing into the left ventricle during diastole.

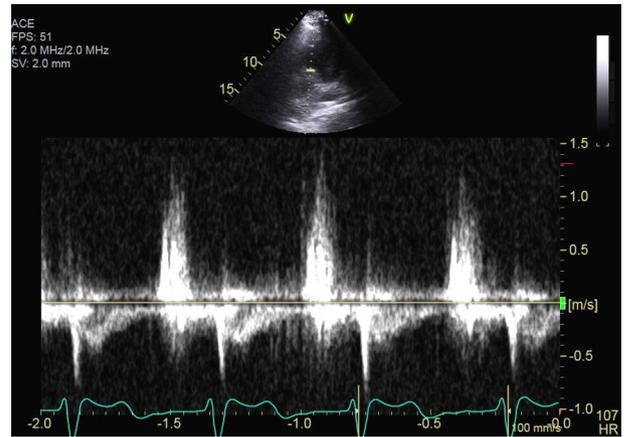


Figure 2 Continuous-wave Doppler spectral display. With the sample volume positioned at the mitral valve inflow, limited forward flow was seen.

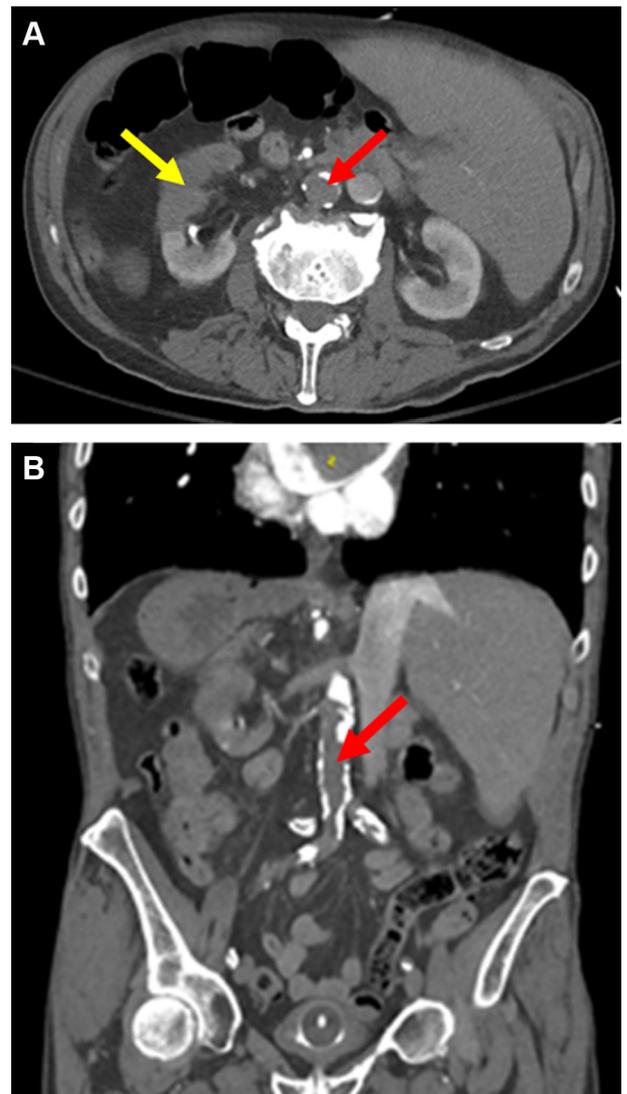


Figure 3 Abdomen/pelvis computed tomography angiography, axial (A) and coronal plane (B), showing a large lobulated mural mass in the abdominal aorta inferior to the right renal and superior left renal arteries (red arrows) and a resultant infarction of the mid to lower left kidney (A; yellow arrow).



Figure 4 Chest computed tomography angiography, axial display demonstrates a large hypodense mass within the left atrium closely associated with the interatrial septum.

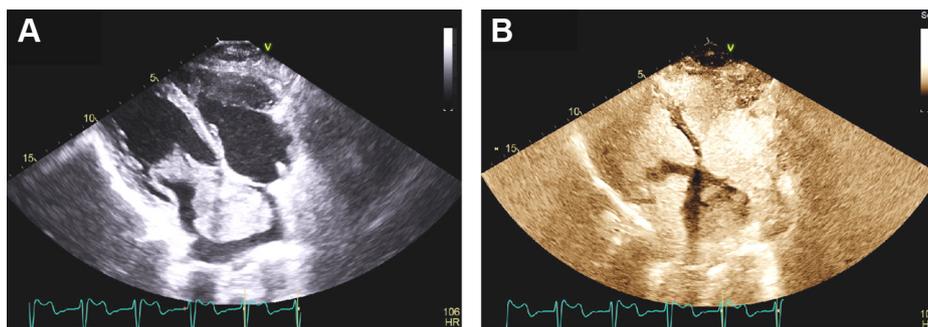


Figure 5 (A) Transthoracic para-apical 4-chamber view showing a heterogeneous mass (5 × 5 × 9 cm) attached to the interatrial septum without an obvious stalk. (B) Transthoracic para-apical 4-chamber view following the administration of an UEA. Contrast uptake suggests a partially vascular mass.

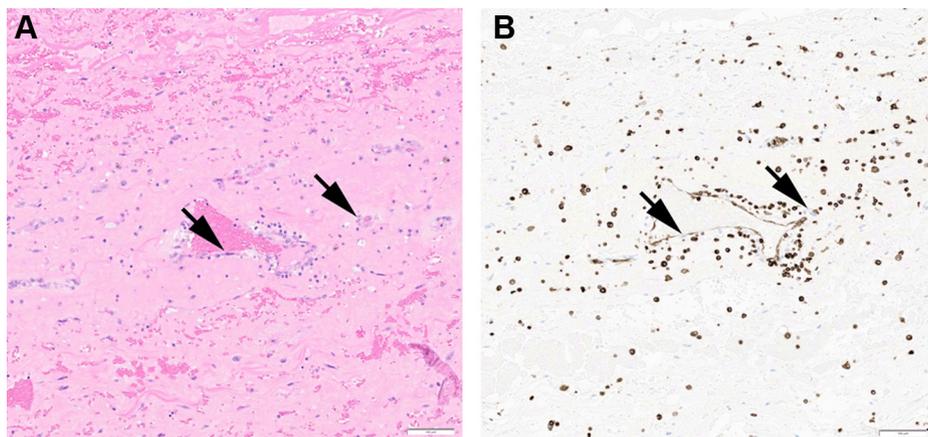


Figure 6 Histologic findings. Histologic sections of the cardiac myxoma showed typical lepidic (myxoma) cells in a myxoid background (A; arrows, hematoxylin and eosin stain). PRKAR1A immunohistochemistry revealed loss of staining in the cells of interest, suggesting a possible PRKAR1A mutation (B; arrows, 100× original magnification).

Transthoracic echocardiography is the first-line imaging modality for the diagnosis of suspected CM, with transesophageal echocardiography, CT, or cardiac magnetic resonance imaging (CMR) recommended if diagnostic uncertainty remains.¹⁰

Echocardiographic features of LA CM are variable but include a narrow stalk with smaller LA CM appearing more papillary or villous and larger LA CM more discrete with a smoother surface or cluster of grapes appearances.⁴ Cardiac myxomas have a poor blood supply

and appear partially enhanced with perfusion imaging using UEAs.^{11,12} On CT imaging, CMs have smooth or villous surface with calcifications seen in approximately 14% of patients.¹³ On CMR imaging, CMs have a heterogeneous appearance on T1- and T2-weighted images and may show delayed enhancement with a patchy distribution.¹³ Regardless of the tumor size, LA CMs are managed with urgent surgical excision to minimize the embolic and cardiovascular complications.¹⁴ The role of anticoagulation is not established, with minimal evidence to suggest it can prevent embolic events.⁵

CONCLUSION

This case is a timely reminder of the added value of POCUS in clinical decision-making, especially in the ED, where rapid diagnosis is paramount. Cardiac POCUS provides a rapid and effective means to identify large cardiac masses with multimodality imaging critical in helping distinguish CMs from thrombi and other tumors.

SUPPLEMENTARY DATA

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.case.2022.04.010>.

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