

How Can a Large Left Atrial Myxoma Cause a Selective Mid-Diastolic Right-to-Left Atrial Shunt?

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A 76-YEAR-OLD MAN was admitted to the authors' institution for evaluation of syncope. The patient suffered a witnessed, brief (15 to 20 seconds) loss of consciousness after standing up from a seated position in his home. The patient's wife called emergency medical services. The patient had no neurologic deficits or other injuries related to the fall, but persistent hypotension was observed in the emergency department that was unresponsive to volume administration. An intravenous infusion of dopamine was required to increase his arterial blood pressure to the normal range. The patient anecdotally reported gradually worsening dyspnea on exertion, lower extremity swelling, and modest weight gain. The past medical history was notable for atrial fibrillation, which was first recognized 1 week before the current admission; treatment with digoxin and furosemide was begun at that time. Trans-thoracic echocardiography was performed as part of the diagnostic evaluation and revealed a 7.6×4.0 cm smooth, highly mobile mass with a broad-based pedicle attachment to the atrial septum that prolapsed through the mitral valve into the left ventricle during diastole. Computed tomography verified these findings. The imaging studies suggested that the mass was most likely a left atrial myxoma. The patient suffered another episode of near-syncope in the hospital during which, his wife reported, he "turned blue." He spontaneously recovered after assuming a recumbent position. The patient subsequently was transported to the operating room for resection of the presumed myxoma. After anesthetic induction and endotracheal intubation, transesophageal echocardiography (TEE) confirmed the preoperative diagnosis (Figs 1, 2, and 3). The left ventricle was relatively underfilled and the right ventricle was markedly dilated (Fig 4). A pulmonary artery catheter was inserted. Central venous and mean pulmonary arterial pressures were elevated (average values of 28 and

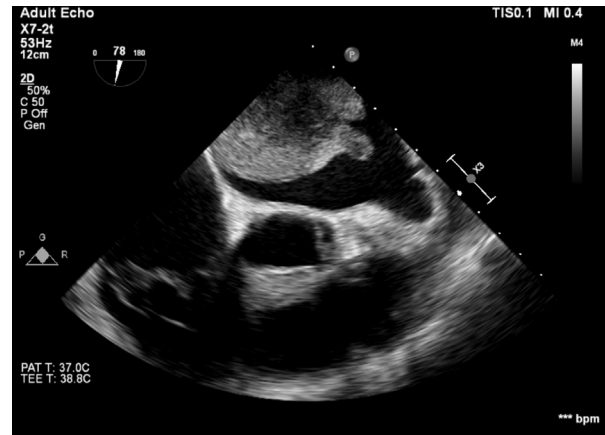


Fig 1. Midesophageal right ventricular inflow-outflow transesophageal echocardiography view showing large lobulated left atrial mass attached to the atrial septum.

36 mmHg, respectively) despite administration of an intravenous infusion of milrinone. An atrial right-to-left shunt tracking along the mass's anterior-superior surface was observed during mid-diastole (Fig 5). The shunt was absent throughout the remainder of the cardiac cycle. Two additional images were obtained (Figs 6 and 7). What is the diagnosis?

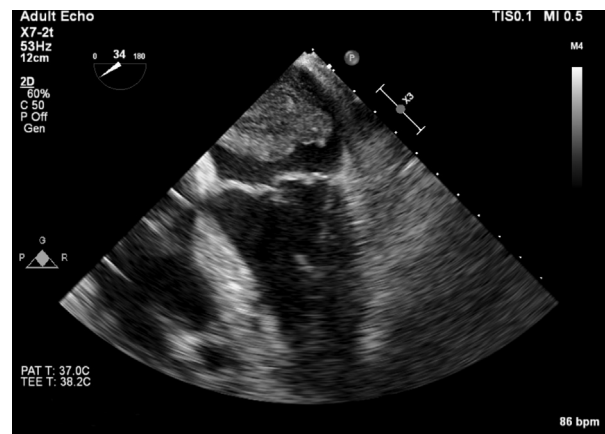


Fig 2. Midesophageal four-chamber transesophageal echocardiography view obtained during systole showing large left atrial mass occupying the majority of the left atrium.

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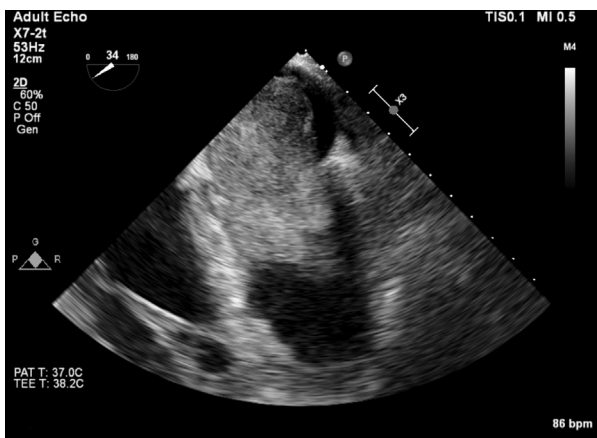


Fig 3. Midesophageal four-chamber transesophageal echocardiography view obtained during mid-diastole showing large left atrial mass prolapsing through the mitral valve into the left ventricle.

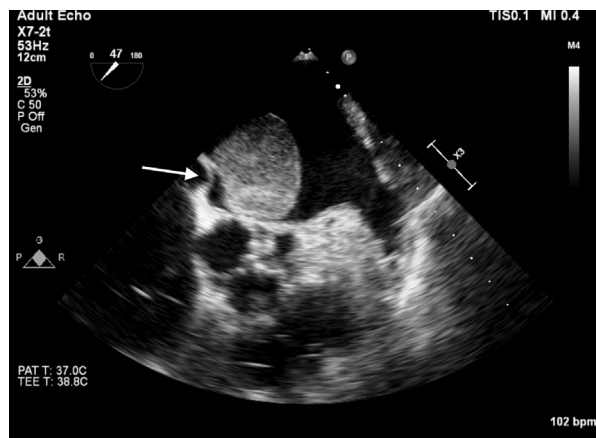


Fig 6. Modified midesophageal aortic valve short-axis transesophageal echocardiography view obtained during early diastole showing deformation of the anterior atrial septum (white arrow) by the movement of the left atrial mass.

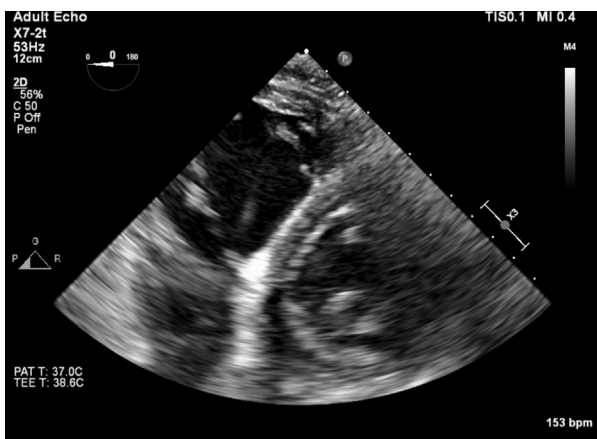


Fig 4. Midesophageal transgastric short-axis transesophageal echocardiography view obtained at end-diastole showing marked right ventricular dilatation.

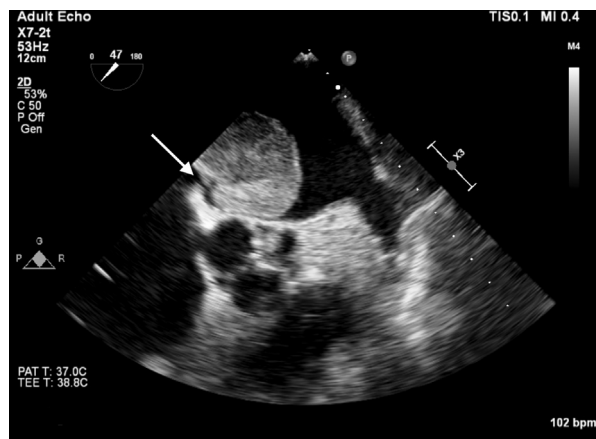


Fig 7. Modified midesophageal aortic valve short-axis transesophageal echocardiography view obtained during mid-diastole showing transient opening in the anterior atrial septum (white arrow) as a result of deformation by movement of the left atrial mass.

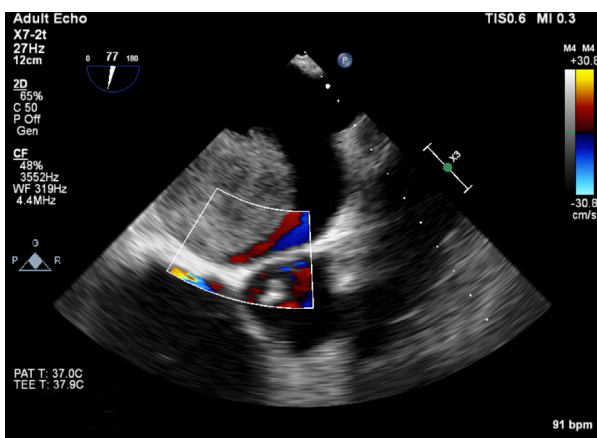


Fig 5. Modified midesophageal aortic valve short-axis color Doppler transesophageal echocardiography view obtained during mid-diastole showing a right-to-left atrial shunt (red) tracking along the anterior-superior border of the left atrial mass.

DIAGNOSIS: MID-DIASTOLIC DEFORMATION OF THE ATRIAL SEPTUM BY THE PROLAPSING MYXOMA CAUSING TRANSIENT OPENING OF THE FORAMEN OVALE AND A RIGHT-TO-LEFT SHUNT

A modified midesophageal aortic valve short-axis TEE view showed that the mass caused deformation of the anterior-superior atrial septum during mid-diastole (Fig 6) coincident with the mass's inferior aspect prolapsing through the mitral valve. The force exerted on the atrial septum by the mass's movement produced transient opening of the foramen ovale (Fig 7). Pulmonary artery hypertension, right ventricular dilatation, and elevated right atrial pressure also were observed, because the mass substantially inhibited left ventricular inflow. When combined with right atrial hypertension, the opening of the foramen ovale resulted in a right-to-left shunt during mid-diastole. The shunt was absent when the atrial septum was not stressed during the remainder of the cardiac cycle despite the sustained increase in right atrial pressure. Indeed, the mass's large size effectively may have

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