BEDSIDE SONOGRAPHY PRIMER:
Critical aortic stenosis

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ABSTRACT
A case of a 52-year-old male with ventricular tachycardia and atrial fibrillation associated with aortic stenosis is outlined. Focused cardiac ultrasound images obtained in the Emergency Department are presented. A discussion of aortic stenosis and emergency ultrasound in the above clinical context is included.


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CASE PRESENTATION
A 52-year-old male with a history of end-stage renal disease and atrial fibrillation presented to the Emergency Department with acute hypotension. The patient had chest pain, presyncopal symptoms, and a blood pressure that was too low to be obtained by manual blood pressure cuff. He was initially in atrial fibrillation with rapid ventricular response, featuring intermittent 10-15 second runs of ventricular tachycardia. The remainder of the patient’s medical history was unknown. A focused bedside echocardiography was immediately obtained to assess the patient’s cardiac status. On ultrasound the patient was noted to have “severe to critical aortic stenosis” and moderate mitral stenosis. The decision was made to immediately bolus the patient with fluid and to perform synchronized cardioversion at 200 joules. Subsequently the patient returned to normal sinus rhythm with a blood pressure of 121/79.

The American College of Emergency Physicians and the American Society of Echocardiography have established a definitive role for focused cardiac ultrasound in the emergency department. Within this paradigm, patients who are hemodynamically unstable with a likely cardiac etiology are evaluated for intravascular volume status and global left ventricular systolic dysfunction.1,2 The patient described herein underwent a comprehensive transthoracic echocardiogram after admission which redemonstrated the findings made on ultrasound in the Emergency Department.

Causes of ventricular tachycardia include long QT syndromes, hyperkalemia, cardiac ischemia, heart failure, and aortic stenosis. In patients with unstable ventricular tachycardia, treatment involves synchronized cardioversion and an amiodarone infusion. In a patient on hemodialysis, other potential causes of arrhythmias such as hyperkalemia, fluid overload, or other metabolic disturbances can cloud the clinical picture when choosing emergent treatment in the setting of hemodynamic instability. As this case demonstrated, bedside ultrasound can help identify cardiac abnormalities which can focus a broad based differential into a specific treatment plan.

Aortic stenosis should be suspected in patients presenting with syncope, angina, and heart failure. Atrial fibrillation and non-sustained ventricular tachycardia are common arrhythmias associated with aortic stenosis.3 Patients with aortic stenosis often have ventricular tachycardia during syncope episodes.4 It is critical to remember that patients with aortic stenosis are preload

Figure 1. Parasternal long axis view of the heart. The right heart is in the near field and the left heart is in the far field. The depth of the aortic valve and the outflow tract is between 5 and 8 cm. Note the enlarged and stenotic aortic valve (AV) as well as the stenotic mitral valve (MV).

Figure 2. Apical view of the heart. The depth of the aortic valve is 10 cm. Note that all 3 leaflets of the aortic valve can be seen as hyperechoic structures. The aortic outflow tract is located just far field from the valve. The stenotic mitral valve is just to the right of aortic valve.
dependent and require aggressive fluid support to maintain their cardiac output. Atrial fibrillation typically causes more severe symptoms in the setting of aortic stenosis due to the non-compliant left ventricle and the resulting greater need for atrial contraction.

REFERENCES


