Unusual Fibrillation in the Emergency Department After Fall

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A 7-year-old man with dilated cardiomyopathy, ambulatory left ventricular assist device (Heartmate II, Thoratec Corporation, Pleasanton, CA), and biventricular pacemaker/implantable cardioverter-defibrillator (ICD) (St. Jude Medical, St Paul, MN) presented with syncope to a local hospital. He was hemodynamically stable and otherwise asymptomatic. His electrolyte panel was unremarkable. Initial ECG diagnosis (Figure 1) was unusual atrial fibrillation. On transfer to our hospital, ventricular fibrillation (VF) was suspected (asterisk in Figure 1), with likely undersensing by a defective ICD resulting in lack of defibrillation and lack of inhibition of atrial-biventricular pacing (arrows). There was pacing noncapture due to VF.

The ICD interrogation (left half of Figure 2) revealed persistent VF (asterisk in Figure 2) for >15 hours in duration. There was alternation between polymorphic ventricular tachycardia and coarse VF throughout this period with no evidence of asystole. The patient only lost consciousness during the initial episode on the basis of his recollections and witness accounts.

Command defibrillation through the ICD, with the use of the device programmer, could not be performed because of interference by the left ventricular assist device with this particular ICD model, a problem that has been reported previously. Successful external defibrillation resulted in sinus rhythm and biventricular pacing with appropriate capture (right half of Figure 2). During the hospitalization, a new sense/pace lead was implanted to correct the undersensing, and the patient was discharged in good condition.

**Discussion**

This patient’s presentation may add to our knowledge about the expected progression of VF to asystole. With sudden cardiac death in the outpatient setting, it has been noted that a VF rhythm will often quickly devolve into asystole.1 It is notable that our patient, with a dilated cardiomyopathy, was...

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**Figure 1. Twelve-lead ECG.**
able to tolerate >15 hours of a persistent VF rhythm that a structurally normal heart would ordinarily not be able to sustain for more than a few minutes. This was most likely possible because of continuous myocardial perfusion provided by the patient’s left ventricular assist device.

In past studies, immediate defibrillation was highly effective if applied in the first few minutes after onset of VF.2 More recently, continued myocardial perfusion has been shown to be crucial for improved outcomes in sudden cardiac death.3 The current advanced cardiac life support guidelines recommend either immediate cardioversion of the rhythm or sustained chest compressions with urgent cardioversion based on the current evidence.4 This case illustrates that VF can be a persistent rhythm in patients who retain perfusion to the myocardium. VF is not predestined to progress to asystole; rather, it is the lack of myocardial perfusion that results in asystole.

Although it may be difficult to conduct a randomized, controlled study to test the effectiveness of chest compressions in providing valuable myocardial perfusion in instances of sudden death due to VF, patients such as ours have shown that perfusion of the myocardium and other vital organs can be lifesaving during the important period of time before definitive care can be provided.

Given the increased frequency of left ventricular assist devices in the ambulatory population, physicians should be aware of life-threatening arrhythmias without hemodynamic instability.

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