Late Manifestation of a Transvenous ICD Lead Perforation

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Case report
An 83-year-old man underwent coronary artery bypass surgery for unstable angina followed by a repeat procedure 13 years later. One year later, a dual-chamber implantable cardioverter-defibrillator (ICD) was implanted following resuscitated cardiac arrest due to ventricular fibrillation. The ICD lead was a Medtronic, (Minneapolis, MN) model 6949 Sprint Fidelis active fixation lead. The lead was positioned at the right ventricular (RV) apex. At implantation the RV pacing threshold was 0.8 volts, at a pulse width of 0.5 ms, with a measured R-wave amplitude of 7 mV and a lead impedance of 745 ohms. Twenty-six months later, during a routine office visit, failure of RV capture at 6 volts was detected, along with a drop in the lead impedance to 276 ohms. The patient reported no symptoms. He was immediately referred for extraction of his RV ICD lead. It was assumed that his clinical presentation was consistent with a fracture of the Sprint Fidelis lead. Review of the chest radiograph taken prior to the extraction procedure showed that the tip of the RV ICD lead extended beyond the cardiac silhouette, suggesting perforation (Figure 1). Therefore, prior to initiating a lead extraction procedure, a pigtail catheter was placed via the right femoral vein at the RV apex and a biplane RV angiogram was performed. Perforation of the RV ICD lead was clearly demonstrated (Movie 1). The patient was taken to the operating room where the heart was exposed via a small subxiphoid incision. The perforated lead was clearly visible. There was no hemothorax or hemopericardium. The lead was percutaneously extracted with a laser sheath while the perforation was surgically repaired and a pericardial drain was placed. The pericardial drain was removed the following morning as there was trivial postoperative bleeding. A new transvenous lead was placed without complications.

Discussion
The Medtronic Sprint Fidelis lead is associated with a high rate of premature failure.1 Recent reports suggest that the failure rate of this lead approaches 3% per year.2 The usual mode of failure is a fracture in the pace-sense conductor which results in an inappropriate shock due to oversensing. Failure to capture may also be observed.2 Management usually involves extraction of the fractured Sprint Fidelis lead and replacement with a new lead.3 The present case illustrates that not all lead malfunction is the result of a lead fracture. Delayed lead perforation is an uncommon but potentially clinically significant complication following ICD implantation.4,5 Risk factors for perforation include patient anatomy, concomitant steroids or anticoagulants, lead design, and lead positioning at the RV apex, as in this case.4,5 In our patient, a preoperative chest radiograph suggested lead migration. An RV angiogram confirmed the diagnosis. Other imaging modalities, such as echocardiography or CT, could have made the diagnosis. However, in our case, the patient was already in the electrophysiology laboratory being prepared for a lead extraction procedure. In the interest of time, we proceeded with an RV angiogram. The extraction procedure was then moved...
to the operating room where the perforated lead was exposed via a subxiphoid incision. This patient had two prior thoracotomies. We, therefore, elected for the surgeon to expose the lead via a subxiphoid incision rather than use an emergent procedure, which could be problematic in the setting of cardiac tamponade and shock. Mobilization of the lead and placement of a purse-string suture prevented potentially catastrophic hemorrhage following percutaneous laser extraction of the ICD lead.

Delayed lead perforation may mimic lead fracture and present as failure to capture. Careful analysis of all clinical data is imperative prior to proceeding with percutaneous lead extraction.

References


**Figure 1:** Posterior-anterior chest radiograph shows that the tip of the right ventricular implantable cardioverter-defibrillator lead extends just beyond the cardiac silhouette, suggesting perforation.