DEVICE THERAPY

COMPLEX CASE STUDY

Retrieval of a Pacing Lead Fragment Embolized into the Coronary Sinus During Lead Extraction

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ABSTRACT. The distal electrode of a chronic passive bipolar pacing lead embolized into the coronary sinus during a lead extraction procedure in a patient with bacteremia associated with erosion of a pacemaker pulse generator. This case report discusses both the means of identifying the unusual site of embolization and the method for retrieving the lead fragment.

KEYWORDS. lead extraction, permanent pacemaker, permanent pacemaker complications, retrieval foreign body.

Introduction

The rising number of cardiovascular implantable electronic devices has led to the increased need for extraction of permanent implanted pacemaker or defibrillator leads. Despite the improved success and safety of lead extraction procedures, complications may still occur. Fracture of the lead during the extraction procedure may result in either retention or, more rarely, embolization of a lead fragment. We present a case of pacemaker lead extraction complicated by embolization of the lead tip to the coronary sinus with subsequent percutaneous retrieval of the fragment.

Case report

An 87-year-old man had a dual-chamber pacemaker implanted in 2004 at another institution for complete heart block utilizing Medtronic CapSure SP Novus 4592 (atrial) and 4092 (ventricle) (Medtronic, St. Paul, MN) bipolar passive fixation leads. He subsequently underwent elective pulse generator replacement in August 2011 for battery depletion. One month later the patient was admitted with methicillin-sensitive Staphylococcus aureus (MSSA) bacteremia of unclear source. He was treated with a short course of intravenous antibiotics and discharged. He was readmitted 2 months later with recurrent MSSA bacteremia. Following a negative transesophageal echo, he received a more prolonged inpatient course of intravenous antibiotics with resolution of the bacteremia and was then discharged home. Seven months later, he was readmitted to outpatient care with a third episode of MSSA bacteremia and overt erosion of the pacemaker through the skin overlying the left chest wall. He was transferred to our institution for extraction of the pacing system. A transesophageal echocardiogram showed no evidence of lead or valve vegetation.

A baseline chest X-ray demonstrated passive atrial and right ventricular leads. The right ventricular (RV) lead was noted to bend at an acute angle as it crossed the tricuspid valve. (Figure 1). Prior to the extraction procedure, a temporary pacing catheter was placed at the RV apex via the femoral vein as the patient was pacemaker dependent. Under sterile technique, an incision was then made superior to the pulse generator erosion. The generator was removed and the leads were exposed. Laser lead extraction was attempted as the leads could not be removed with simple traction. Lead-locking stylets were passed to the tip of each lead. A 14-French (Spectranetics, Colorado Springs, CO) laser sheath was utilized along with an M outersheath. Sequential laser energy was then applied to each lead as it entered the
central circulation. During countertraction, both leads retracted into the superior vena cava. During the maneuver to remove the RV lead with countertraction, the inner conducting coil suddenly broke and recoiled leaving the outer coil and lead intact. A larger lead-locking stylet was passed down the lumen of the outer conducting coil. As the stylet met the proximal electrode, the distal electrode tip dislodged and embolized. Fluoroscopy demonstrated that the lead tip fragment had migrated to the mid-portion of the coronary sinus. The remainder of the RV lead was then removed with countertraction and laser energy without difficulty. The right atrial lead was then easily removed with the laser sheath and counter traction. The infected pulse generator pocket was debrided and packed with gauze to allow the wound to close with secondary intention.

To recover the retained fragment, we accessed the coronary sinus using a superior approach. Using sterile technique and ultrasound guidance, the left internal jugular vein was cannulated with a needle, and a guidewire was advanced to the right atrium. An 11-French dilator introducer sheath was inserted over the guidewire. An 8-French Medtronic extended hook-guiding catheter was then inserted into the sheath, and advanced into the mid-portion of the coronary sinus with the assistance of a deflectable catheter. The lead fragment was observed to be highly mobile (Figure 2, online video supplement). A coronary sinus venogram was performed by using a balloon floatation catheter, which was inflated in the mid-body of the coronary sinus. (Figure 3, online video supplement). A 12–24 mm EN Snare (Merit Medical Systems, Inc., South Jordan, UT) device was advanced through the 8-French coronary sinus catheter into the coronary sinus where the fragment was snared, withdrawn into the sheath, and removed (Figure 4). Following removal of the fragment, an active fixation 5076 Medtronic pace sense lead was advanced through the sheath to the right ventricle and connected to an externalized pacemaker. The system was secured to the skin overlying the left neck and chest to allow for prolonged temporary VVI pacing. The patient received 14 days of intravenous antibiotics and had persistently negative
blood cultures. A new permanent pacing system was then implanted on the right side without incident.

Discussion

Complications resulting from extraction of a permanent pacing system have been well described. The incidence of fracture and embolization of a lead fragment is rare, occurring in 0.1–0.2% of extraction procedures.2,3 Most commonly, pacing lead fragments embolize to the pulmonary arteries.4 We present a case of extraction of a permanent pacing system with embolization of the lead tip into the coronary sinus. The fragment was successfully retrieved utilizing a coronary sinus access sheath commonly used for left ventricular lead implantation as well as a snare commonly used by interventional radiologists for foreign body retrieval. In our case, the sharp angulation of the lead between the proximal and distal electrode as the lead entered the right ventricle may have caused weakness in the lead body facilitating electrode fracture during the extraction procedure. Occasionally, distal fragments are unable to be removed or a clinical decision has been made to leave the fragments in place. This decision is more complex when the indication for extraction is infection, as complete system removal is recommended. This case demonstrates that interventional radiology colleagues may provide additional techniques and expertise for successful extraction of embolized lead fragments.

References