Asymptomatic Cardiac Embolism of a Retained ICD Lead Component in a Patient after Orthotopic Heart Transplantation

MAYURKUMAR BHAKTA, MD, DAN SORAJJA, MD, LUIS R. SCOTT, MD, FACC, FHRS and GREGORY T. ALTEMOSE, MD, FACC, FHRS

Divisions of Cardiovascular Diseases, Mayo Clinic Hospital, Phoenix, AZ

KEYWORDS. embolization, ICD, lead extraction, orthotopic heart transplantation.

Introduction

Orthotopic heart transplantation (OHT) is frequently employed to treat patients with severe cardiomyopathies who suffer from unremitting congestive heart failure (CHF). Prior to consideration for transplantation therapy, the majority of these patients meet criteria for and undergo implantation of internal cardioverter-defibrillators (ICDs). Most patients undergo placement of these devices many years prior to their heart transplantation procedures. A multitude of in vivo chronic adaptive changes may occur after the initial implantation procedure of the ICD generator and lead systems. These changes can include vascular adhesions to the transvenous leads, potentially causing difficulty during removal of the device system at the time of an OHT procedure. Complications during attempted transvenous lead extraction, including lead fragmentation and embolism of fragments, have been previously reported.1,2 We report an unusual case of asymptomatic embolism of a surgically ligated retained ICD lead component after OHT.

Case report

A 48-year-old woman was in her usual state of health until April of 2002, when she was admitted to a local hospital after suffering an abrupt syncopal event preceded by 1 week of “flu-like” symptoms. During her acute hospitalization, a thorough evaluation led to a diagnosis of severe non-ischemic cardiomyopathy of undetermined etiology (possibly viral). Her syncope was presumed to be of cardiac origin, and she underwent placement of a St. Jude dual-chamber ICD (right atrial (RA) pacemaker lead St. Jude Tendril 1488/46, and right ventricular ICD lead St. Jude Riata Durata 1580/65, St. Jude Corp., St. Paul, MN). She did well through the intervening years with aggressive pharmacologic intervention until 2006, when progressive CHF prompted an upgrade of her previous device to a biventricular ICD, with implantation of a new left ventricular (LV) lead (St. Jude Quicksite 1056/75, St. Jude Corp., St. Paul, MN). Her CHF therapy was subsequently optimized utilizing a combination of pharmacologic and cardiac resynchronization therapy (CRT).

At the age of 54 years she progressed to New York Heart Association functional class IV symptoms and her care was transferred to our institution for consideration for OHT. Despite further maximization of her medical therapy (including intravenous inotropic agents), she continued to exhibit refractory CHF symptoms and was ultimately listed for consideration for OHT, which was ultimately performed in July of 2008. During the procedure, the native heart was explanted, along with successful removal of the ICD generator, and the transvenous RA and LV leads. The ICD lead could be partially mobilized at the proximal and distal aspects, but proved to be fixed in the mid-portion, at the level of the left brachiocephalic vein. Repeated attempts to
remove the intact ICD lead, including vigorous proximal and distal mechanical traction, were employed without success. At this point, with the best interest of the patient in mind, the ICD lead was ligated both at the level of the pocket/clavicle and at the junction between the left brachiocephalic vein and the superior vena cava. Thus, the immobile lead remnant was left in place (uncapped) and the OHT procedure was completed using an atrial–atrial anastomosis without further consequence. A postoperative chest radiograph showed the frayed distal and proximal ends with partial uncoiling of the lead, consistent with prior traction attempts and ligation (Figure 1a,b).

Three months after successful OHT, the patient presented to the emergency department with symptoms of acute delirium. The general evaluation to determine the etiology of her delirium included chest radiographs (Figure 2a,b), which showed a foreign object within the cardiac silhouette. It appeared to be in the region of the right ventricle, extending into the pulmonary artery. Her delirium was attributed to an acute reaction to steroids, previously initiated at high doses for immunosuppressive therapy. This resolved promptly with proper adjustments to her therapy. Further radiologic evaluation of the foreign object with computed tomographs showed it to be a metallic structure, possibly related to the indwelling lead remnant.

Owing to the high suspicion that the object represented an embolized fragment from the ICD lead, a decision was made to attempt a retrieval of the object utilizing a percutaneous approach. Right femoral venous access was obtained via the standard Seldinger technique. A 7-French modified pigtail VanAman catheter was advanced to the pulmonary artery. This was exchanged

![Figure 1](image1.png)

Figure 1: (a) Posterior–anterior chest radiograph displaying ligated internal cardioverter-defibrillator (ICD) lead, shortly after orthotopic heart transplantation. (b) Lateral chest radiograph displaying ligated ICD lead, shortly after orthotopic heart transplantation.

![Figure 2](image2.png)

Figure 2: (a) Posterior–anterior chest radiograph with magnification of the area with the foreign body. (b) Lateral chest radiograph with magnification of the area with the foreign body.
over a 0.035 inch Rosen wire for an Amplatz gooseneck snare catheter, which was then successfully used to remove the object (Figure 3a–e). Pathologic examination of the object identified it as a wire fragment from the retained remnant of the St. Jude ICD lead (Figures 4a,b). During the procedure, the remaining portion of the lead was not manipulated and no attempts to remove it are currently planned. Despite close monitoring, with frequent follow-up evaluations and radiographs, the patient has experienced no further evidence of embolization of any lead fragments for more than 2 years after the initial fragment was snared and removed.

Discussion

We present a unique case of asymptomatic cardiac embolism of a retained ICD lead component in a patient after orthotopic heart transplantation. In this case, close follow-up after OHT identified the embolized fragment before any adverse sequelae occurred. Successful percutaneous retrieval was performed and short-term close observation has not revealed any further displacement of lead fragments or movement of the existing retained lead remnant. Abandonment of non-transected leads has not been associated with any adverse outcomes compared with controls and appears a safe alternative to attempts at lead extraction. The rate of adverse events, however, may increase (up to 20% in one series) if a lead is left in place after a failed extraction that involves transection of the lead. Migration of the lead or embolization of fragments of the lead is a known, serious complication related to transvenous extraction techniques. Complications such as pulmonary embolism, hemopericardium due to right ventricular perforation, cerebral embolism due to perforation of atrial septum, or paradoxical embolism of lead fragments have all been described. This embolization of a wire component from within the core of a proximally and distally ligated indwelling ICD lead fragment has not been previously described and potentially supports the idea of capping (particularly at the distal aspect) or removing all surgically ligated or uncoiled abandoned leads if left in situ.

In our case we chose to adopt an approach of careful observation and follow-up rather than attempt a percutaneous or probable surgical removal of the lead remnant in this OHT recipient. We made this decision knowing that the risk of death associated with lead extraction is not trivial and there is little information regarding risk factors to identify those who can safely undergo extractions, particularly in this situation. Fortunately, in the case of our patient, there were no associated complications related to embolization of the lead fragment or the retrieval process and no further issues of this nature have recurred despite very close observation and serial radiographic studies.

Figure 3: (a–e) Retrieval of fragment with gooseneck snare catheter using a femoral vein approach.
This case is a demonstration of the potential pitfalls of failed or partial lead extractions. It is also a demonstration, however, that serial evaluations of such situations is warranted, and removal of any embolized fragments can usually be safely performed percutaneously.

References