Infection of retained defibrillator lead fragment after heart transplant

Emanuele Durante-Mangoni,[1,2] Martina Vitrone,[1] Irene Mattucci,[1] Vincenzo Caprioli,[3] Ciro Maiello[4]

[1]Department of Internal Medicine, University of Campania "Luigi Vanvitelli"; [2]Unit of Infectious and Transplant Medicine, AORN dei Colli-Monaldi Hospital, Naples; [3]Unit of Cardiac Pacing, AORN dei Colli-Monaldi Hospital, Naples; [4]Unit of Heart Transplants, AORN dei Colli-Monaldi Hospital, Naples, Italy

Abstract

A 59-year old heart transplant recipient was admitted due to continuous pain in her left axilla. A purulent collection was found at the site of prior defibrillator placement, where a remnant proximal segment of an electric lead was found. Two years before, the patient had had pocket infection treated with revision, but without device extraction. The remnant lead was eventually removed transvenously without complications. This is the first description of infection complicating retention of lead fragments after heart transplant. The role of biofilm and net immune state on the persistence and late recurrence of infection is discussed.

Introduction

Retention of pacing and defibrillating lead fragments may occasionally occur after heart transplantation. Its actual incidence and clinical significance, however, has been studied in a single cohort.[1] In particular, the potential risk for bloodstream infection remains elusive. Here, we describe a case of infection of an automatic implantable cardioverter defibrillator (AICD) lead fragment and review the existing literature on lead retainment.

Case Report

A 59-year old woman came to our hospital in May 2013 because of low grade, continuous pain in the left axilla, without fever, chest pain or dyspnea.

Nine years before presentation, dilated cardiomyopathy with normal epicardial coronary arteries was diagnosed. Due to worsening of this condition, a dual-chamber AICD was placed in 2007. In October 2009, due to malfunction of the ventricular lead, a second ventricular catheter was added, without removal of the previous one (Figure 1A). Eight months later, the patient developed swelling, pain and redness at AICD generator site and pocket infection was diagnosed. After an ineffective course of antibiotics and anti-inflammatory drugs, pocket revision was performed, with removal of infected subcutaneous tissue and generator exchange. No relapse of infection was observed during the next 18 months. In February 2012, because of progression to end-stage heart failure, the patient underwent orthotopic heart transplantation (OHT) with AICD removal. However, the proximal end of one ventricular lead was not completely removed, and was abandoned within the innominate vein and the AICD pocket (Figure 1B). The patient was then started on a standard immune suppressive therapy with cyclosporine A, everolimus and prednisone. Fifteen months later, the patient presented to us with left axillary pain. On clinical examination, she showed a tender, fluid collection in the left axilla that was drained by US-guided percutaneous tap. Fluid culture grew methicillin-resistant *Staphyloccoccus epidermidis* and cytology and chemistry were consistent with a purulent material. Antibiotic therapy with cotrimoxazole was started and a transesophageal echocardiography performed. No vegetations were seen on the intravascular portion of the retained lead fragment within the superior vena cava as well as the right heart chambers. Plasma d-dimer levels were normal, as were C-reactive protein levels and white blood cell count. One week later, transvenous lead extraction was performed for adequate infection source control. After having carefully freed the catheter, telescopic sheats were used to dissect the initial intravascular portion of the retained lead. Subsequently, lead dissection was completed using an Evolution mechanical dilator sheat. No locking stylet was used. There were no complications. Lead culture grew the same Staphylococcus species previously isolated from fluid culture. No recurrence of pocket swelling was observed during the following two years and the patient remains well at present.

Discussion

Heart transplant candidates are increasingly treated with AICD implantation for sudden cardiac death prevention. Retention of AICD leads or lead fragments in central veins after heart transplantation may occur. In a retrospective study, Kusmierski *et al.* studied a group of 73 consecutive patients who underwent OHT between 2009 and 2011.[2] Before transplant, 21 of them had an AICD and 15 a cardiac resynchronisation therapy (CRT) device in place. The mean time from AICD/CRT implantation to OHT was 27±59 months (range 2-120). At the time of transplant, hardware was not removed completely in 7 cases (19.5% of patients with an implanted device), largely due to lead segment adhesion to the vessel wall. None of these patients developed device infection. Notwithstanding, all remnants were subsequently extracted by means of either transvenous lead extraction with the Cook system (6 cases) or direct traction under fluoroscopic guidance (1 case). Authors recommend that, when all hardware cannot be removed during OHT, the distal lead portion should be cut off at the level of the superior vena cava, leaving the remaining lead intact for transvenous extraction at a later time. To ease percutaneous removal, lead remnants dwelling in the device pocket should not be cut off. This would avoid vessel wall damage, lead fragmentation induced by forceful traction, as well as infectious complications in immune suppressed patients. As the optimal timing

Correspondence: Emanuele Durante Mangoni, Monaldi Hospital, piazzale Ettore Ruggieri, 80131 Napoli, Italy.
Tel.: +39.081.706.4153 - Fax: +39.081.770.2645.
E-mail emanuele.durante@unina2.it

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of lead extraction after OHT remains unclear, Kusmierski at al. suggest the procedure should be performed as soon as possible once patient conditions have stabilised.[2]

Martin *et al*. collected data retrospectively on 56 OHT recipients from 2002 to 2010 who had a cardiac implantable electronic device (CIED) *in situ* at the time of transplant.[1] In 22 patients (39%), the device was not completely removed during OHT. In this study, 3 device retention patterns were described according to location and type of hardware: 5 subjects had fragments confined to the device pocket only (type 1), 7 to the central venous system only (type 2) and 10 in both the device pocket and central venous system (type 3). The most common sites of retained fragments were the subclavian, innominate and superior cava vein. The median duration between device implantation and OHT was 47 months (16-68) for patients with retained hardware and 14 (3-24) for those without, a statistically significant difference ($p<0.01$). Indeed, patients who underwent OHT more than 18 months after CIED implantation were twice as likely to retain fragments after surgery as those carrying the device for a shorter time. In this experience, only 2 of the 22 patients underwent percutaneus extraction of the devices within 7 days of OHT. In the remaining patients, embolization, endoluminal migration and erosion into the mediastinum occurred in one case each (4%) during a median follow-up of 42 months. No adverse clinical sequelae, infection (either suspected or proven) or mortality occurred in these 22 patients.[1]

Lorsheyd *et al*. described a case of a 53-year-old woman with severe acute chest pain and palpitations. She had previously received an epicardial AICD due to ventricular tachycardia caused by arrhythmogenic right ventricular cardiomyopathy. Ten years before admission, OHT had been performed and a lead segment had been left behind the sternum within the chest wall, remaining fixed at the diaphragm level over the years. On admission, the same fragment had migrated to the right heart, see on echocardiography as loosely attached to the free wall of the right ventricle and subsequently moved to the right pulmonary artery, causing patient symptoms.[3]

Finally, Luehr *et al*. reported on a case of pacing lead fragment dislocated into the graft left ventricle during OHT.[4]

Our case report is consistent with the above-presented findings. It further suggests that once an AICD or permanent pacemaker catheter becomes infected, microbial growth may recur even after months or years and infection relapse, until complete hardware removal is accomplished. We acknowledge infectious and non-infectious complications, such as distal catheter fragments embolization or endoluminal migration, although possible, occur rarely in heart transplant recipients with prior electronic devices. However, we believe that efforts should be made to remove all abandoned lead remnants during or after heart transplantation. Our experience shows that transvenous lead extraction techniques are feasible in this clinical setting. Preservation of lead insulation and avoidance of catheter breach are important to ease extraction and prevent large vein damage or tears.

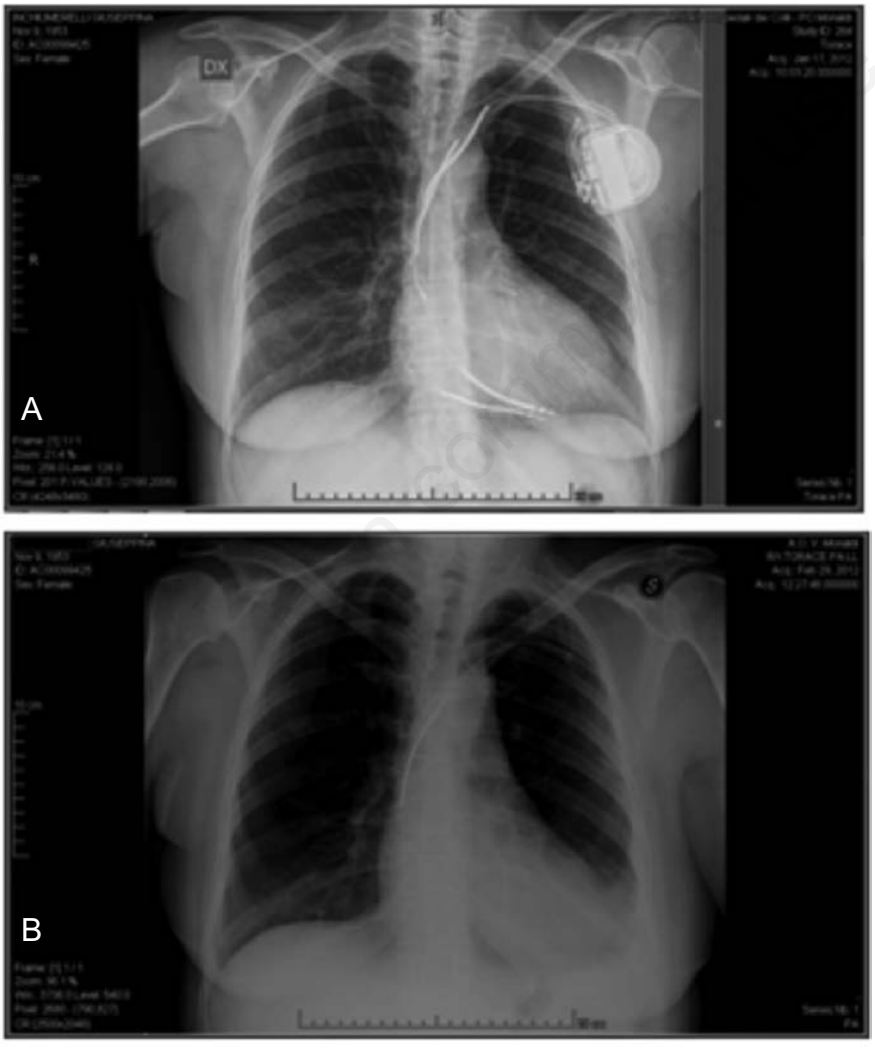

Figure 1. A) Pre-transplant patient chest X-ray (CRX) showing the biventricular automatic implantable cardioverter defibrillator device with two ventricular leads. B) Post-transplant CRX showing the remnant lead spanning from the innominate vein to the axillary region.

Conclusions

AICD lead fragment retainment may occur after OHT. The actual incidence and the clinical implications of this condition are poorly defined. Our clinical experience suggests that when a prior AICD-related infection has occurred, a conservative approach may translate into relapse of infection. This may happen years later, and be possibly favoured by immune suppression. In the absence of prior AICD complications, the optimal management of persisting lead fragments after OHT remains elusive, also considering the low risk of embolic and infectious complications described by other authors.

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