Case Report

**Candida glabrata Infection on Retained Implantable Cardioverter Defibrillator Lead in Heart Transplant Patient Requiring Redo Upper Mini-Sternotomy Approach**

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**Abstract**

We present the first documented case of a *Candida glabrata* infection on the retained lead of a cardiovascular implantable electronic device (CIED) in an immunosuppressed heart transplant recipient. This is the first documented case of a redo upper mini-sternotomy approach for a lead removal and innominate vein reconstruction with bovine patch. The patient is a 55 year-old male with non-ischemic cardiomyopathy with biventricular implantable cardioverter defibrillator (ICD) placement who underwent orthotropic heart transplant. ICD leads were divided at that time. A contralateral pacemaker was inserted post-operatively for complete heart block. The patient presented with four weeks of fever and erythema at the site of previous ICD placement. Transesophageal echo revealed echogenic structures measuring 1.8 cm and 1.1 cm attached to the pacer wire near the junction of the right atrium and inferior vena cava. Pacemaker leads were removed successfully. However, one of the three ICD leads fractured during extraction, leaving a residual coil. Culture of the extracted leads grew *C. glabrata*. A multi-disciplinary team including cardiothoracic surgery, infectious diseases, and cardiology determined that the most reliable way to eradicate infection would be to combine surgical management with aggressive medical management. Given multiple prior sternotomies, risk of re-entry into the thoracic cavity posed additional risks. An alternative surgical approach was performed to minimize risk.

**ABBREVIATIONS**

CIED: Cardiovascular Implantable Electronic Device; ICD: Implantable Cardioverter Defibrillator; SVC: Superior Vena Cava; IV: Intravenous

**CASE PRESENTATION**

The patient is 55 year old Caucasian gentleman with a history of non-ischemic cardiomyopathy with biventricular implantable cardioverter defibrillator (ICD) placement seventeen years prior. Eight years before presenting, he underwent an orthotropic heart transplant. In the two months prior to heart transplant, he required implantation of biventricular assist devices. At the time of heart transplant, his ICD was removed. The leads were divided at the superior vena cava (SVC) and in the pocket on the left.

Post-transplant, the patient experienced complete heart block requiring placement of a dual chamber pacemaker on the right.

The patient presented to the hospital with four weeks of intermittent fevers and swelling, redness and pruritus at his previous ICD site. He also endorsed lethargy and unintentional weight loss. His symptoms persisted despite a two-week course of doxycycline. The patient’s immunsuppression included tacrolimus 2.5mg daily (level: 12.6 ng/mL) and mycophenolate mofetil 3g daily.

Physical exam was notable for erythema and swelling on the left side of the chest over the previous ICD site (Figure 1). The patient’s CBC revealed: white blood cell count of 3.82 K/cm, absolute neutrophil count of 5.92 K/uL, and absolute lymphocyte...
count of 0.42K/μL. Chest x-ray revealed intact pacemaker leads. Three retained ICD leads were identified on the left.

A transesophageal echocardiogram revealed two long, echogenic structures measuring 1.8 cm and 1.1 cm that were attached to the pacemaker wire in the right atrium near the inferior vena cava and right atrium junction (Figure 2). There were no valvular vegetations. The patient was started on vancomycin and ceftriaxone.

The dual chamber pacemaker leads on the right were extracted and sent for culture. The previous left ICD pocket was notable for purulent material. Of the three ICD leads on the left, remnants of two of the pacing leads were removed. One of the ICD leads fractured, and its coil remained in the innominate vein extending into the SVC (Figure 3).

*Candida glabrata* grew from the right pacemaker pocket and two of the old ICD leads on the left. The strain was susceptible to micafungin and had dose dependent susceptibility to fluconazole. Blood cultures revealed no growth. Beta-D-glucan testing was <31 pg/mL. Micafungin was initiated.

The patient underwent a redo sternotomy with upper right mini hemisternotomy for removal of retained lead and sheath from innominate vein and SVC along with reconstruction of those structures with bovine pericardial patch. Cardiopulmonary bypass was achieved with common femoral artery and vein cannulation. A second right intercostal incision was then performed to obtain access so as to free the anterior mediastinal structures off the post cortical table of the upper sternum. The innominate vein was then opened longitudinally extending onto the SVC. The lead coil and sheath appeared grossly infected and were densely adherent to the innominate vein and removed. The defect was then reconstructed with bovine pericardium.

Gram stain of the wire revealed budding yeast and culture grew *Candida glabrata*. The patient did well and was discharged on post-operative day 4. Micafungin 100mg IV daily was switched to lipid amphotericin B 5mg/kg IV daily once culture data returned, and the patient was discharged on lipid amphotericin B.

Aggressive medical management has included IV antifungal therapy followed by step down oral antifungal therapy. The patient had increased creatinine along with nausea and vomiting with lipid amphotericin B and tolerated two weeks of this therapy. He resumed micafungin, completing ten weeks of micafungin for a total of twelve weeks of an IV antifungal since the date of surgery. After the three months of IV antifungal therapy, he has now completed three months of posaconazole therapy. He has resumed his daily activities and will be monitored off antifungal therapy.

**DISCUSSION**

*Candida* [1], and specifically *C. glabrata* [2-5], CIED infections have been documented in case reports or small case series. While immunosuppression has been cited as a risk factor, to our knowledge this is the first reported case in a heart transplant recipient. While authors have advocated for prompt device removal in the setting of *Candida* device infection [6], management strategies and outcomes are not well established in this scenario.

The Infectious Diseases Society of America and American Heart Association guidelines recommend complete device and lead removal in patients with definite CIED infections [7,8]. Furthermore, early device removal is associated with improved survival at one year in cases of CIED infective endocarditis [9].
Cardiothoracic surgery, transplant infectious diseases, and transplant cardiology determined that our patient’s best chance for cure was surgical removal of the retained coil despite surgical risk.

Medical management alone would be ineffective because *Candida* species produce biofilms on synthetic devices, rendering them very difficult to eradicate from infected devices [1]. *C. glabrata* is known to have emerging resistance to both azoles and echinocandins [10,11]. An immunosuppressed heart transplant recipient would be at highest risk to fail medical therapy. Given that the retained lead had a gross appearance of infection and culture positivity for *Candida glabrata* while on IV micafungin, our case suggests the importance of device removal, especially in this population.

Surgery and location of the lead also carried a high mortality risk. Given prior thoracic surgeries, there was significant inflammation and the right ventricle was adherent to the sternum. Our surgical approach minimized damage to the right ventricle and other underlying structures.

To our knowledge, this is the first documented approach for a redo upper mini-sternotomy for infected lead removal with innominate vein reconstruction with bovine patch. Reports documenting success of upper mini hemisternotomies in redo cases include aortic valve replacements [12-15], thoracic aortic aneurysms [16], and aortic root and ascending aorta surgeries [17]. Though not a redo case, there is prior evidence that a ministernotomy approach has been successful in an innominate vein repair [18]. Our case highlights the utility of this less invasive surgical technique.

### CONCLUSION

In cases of *Candida* species associated with CIEDs, the entire device needs to be removed for definitive treatment. This is especially true in solid organ transplant recipients, as immunosuppression renders antifungal therapy alone an ineffective approach. In this case, an alternative surgical approach utilizing an upper mini-sternotomy approach for wire removal and innominate vein reconstruction with bovine patch was undertaken to minimize risks.

### REFERENCES


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