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Cardiovascular Implantable Electronic Device Removal in a Patient with Negative Blood Cultures

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INTRODUCTION

Rates of cardiovascular implantable electronic device (CIED) infection over past decades have been on the rise. CIED infections are associated with twice the risk for in-hospital death.[1] Diabetes mellitus and renal dysfunction are identified risk factors for developing CIED infections,[2] and blood cultures are not always positive in patients with CIED vegetations.[3] With more patients receiving CIEDs, recognition and appropriate management of CIED infections are essential. This case report discusses a patient with pacemaker lead vegetations without bacteremia in the presence of suspected infectious source who underwent removal of the CIED system.

CASE REPORT

A 65-year-old male presented with a two-day history of worsening pain in his left lower extremity (LLE) with associated increased swelling and presence of skin ulcerations. He recently had completed a 10-day antibiotic course of sulfamethoxazole-trimethoprim for the skin lesions. On physical examination, the patient had bilateral pitting edema and skin ulcerations with minimal clear drainage on the anterior surface of the LLE with associated tenderness. The right leg had a small ulcer along a prior incision scar at a previous amputation site. The patient denied any fever, chills, or chest pains.

His pertinent past medical history included ischemic cardiomyopathy requiring coronary bypass surgery (CABG) about five years prior to presentation and a biventricular pacemaker-cardiac resynchronization therapy device about three years ago. He had atherosclerotic peripheral vascular disease, hypertension, and type-2 diabetes mellitus with right below knee amputation, bladder cancer in remission, and tobacco use for about 45 years.

A Doppler ultrasound of the LLE on presentation showed occlusion of the left posterior tibial and peroneal arteries. While an MRI of the leg was not possible due to a non-MRI compatible implantable cardioverter device (ICD), an x-ray did not reveal features of osteomyelitis. His work-up revealed leukocytosis (white blood count of 12.6 x 10^9/L) with an elevated sedimentation rate (47 mm/h) and C-reactive protein (CRP; 5.2 mg/dL), making the diagnosis of osteomyelitis still plausible. An echocardiogram revealed an estimated ejection fraction of 20 to 25% with diffuse hypokinesis. A 1.1 cm by 2.6 cm flat apical (mural) thrombus and a mobile density measuring 1.4 cm by 0.9 cm on the patient's pacemaker wire were noted. These findings were confirmed with a transesophageal echocardiogram, which revealed a mid- to large-sized, 1.5 cm by 0.7 cm vegetation on the right atrial pacing wire, and another vegetation of mid-size on the ventricular lead (Figure 1).

On admission, the patient was started on broad-spectrum antibiotics and anticoagulation for the mural thrombus. After a multi-disciplinary team discussion, the patient underwent removal of the ICD and the 3-lead defibrillator system, and surgical debridement of the defibrillator pocket. The patient's wound culture from lesions on his LLE grew *Pseudomonas putida* and *Enterococcus faecalis*, and the final report for his blood cultures and lead-tip cultures post-device explantation were negative. The patient's post-procedural clinical status deteriorated, progressing to cardiogenic shock and renal failure requiring hemodialysis and ionotropic support. The patient died 18 days post-hospitalization due to a massive gastrointestinal bleed suspected secondary to acute bowel ischemia.

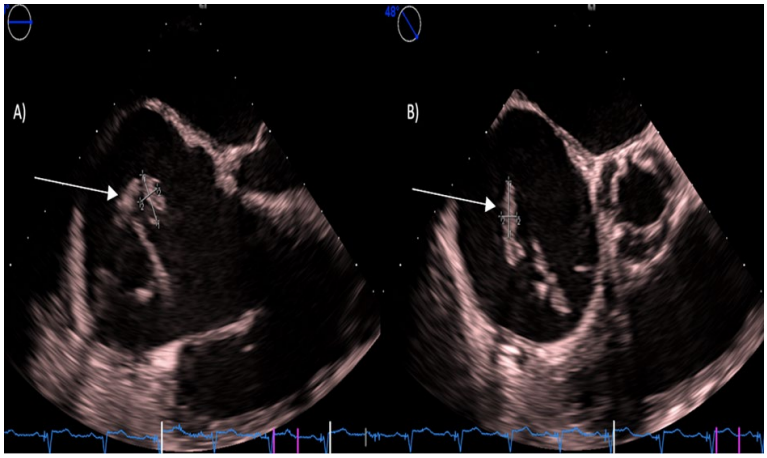

Figure 1. Images from transesophageal echocardiogram. A) Mid-esophageal, 4-chamber view, showing the mobile right atrial thrombus (arrow); B) Mid-esophageal, aortic valve short axis view, demonstrating vegetations (arrow) along the right ventricular lead.

DISCUSSION

Staphylococcus species have shown to be responsible for about 60-80% of most reported cases of infected CIED systems, although it is important to identify and treat other potential infectious causes.[3] Gram negative bacteria only account for a minority of CIED infections. Therefore, initiation of broad-spectrum antibiotics with Staphylococcus coverage is central to the initial management. Recommendations for duration of antimicrobial therapy ranges between 10-14 days from the time of CIED removal.[4] Per the American Heart Association guidelines,[3] removal of the CIED is a Class I recommendation for all patients with a definite CIED infection, evidenced by valvular/lead endocarditis or sepsis or in occult staphylococcal bacteremia. In cases of occult persistent gram-negative bacteremia, it is considered to be a reasonable option. About 5% of lead-adherent masses, in fact, may represent a thrombus instead or a fibrin tissue growth on the lead, for which reason CIED removal is not usually an immediate consideration in patients without bacteremia.[5]

Despite the absence of bacteremia, device explantation was determined to be the next best step in the patient's case after undertaking a heart-team approach involving specialists from cardiology, cardiothoracic surgery, and infectious disease. There were several risk factors

that put the patient at high risk for a CIED infection. First, the presence of lead vegetations in the setting of recent completion of an antibiotic course prior to presentation may have contributed to the negative blood cultures. Infected skin ulcerations subsequently were suspected on wound culture results. Additionally, the patient's underlying risk factors including poor glycemic control and vasculopathy, with some suspicion for osteomyelitis, put him at an increasingly high risk for bacteremia.

Diagnosis of CIED infection requires a high index of suspicion in the setting of lead vegetations or endocarditis despite negative blood cultures. Such patients may have underlying risk factors, markers suggestive of an inflammatory process, and a suspected source of infection. A decision to proceed with device removal must be taken by a heart-team approach.

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