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Case Report

Always Check the Lead!… Unique Case of Cardiac Arrest Due to Pacemaker Infective Endocarditis

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Abstract

53-year-old patient with multiple recurrent admissions for chest pain and low-grade fever presented after recent discharge for the same complaint. In his previous admission, cardiac work-up was done with no significant findings and he was discharged on oral antibiotics. However, upon this admission he developed cardiac arrest due to ventricular fibrillation and was intubated. Upon further assessment and intervention, he was found to have Pacemaker-lead-wire infective endocarditis. We share this interesting case as Infective endocarditis could present as a vague symptom that needs further intervention.

Keywords: Infective Endocarditis; Pacemaker Lead infection; Cardiac Arrest

1. Introduction

Traditionally, cardiac implantable electronic devices (CIEDs), including pacemakers (PPMs), implantable cardioverter-defibrillators (ICDs), and cardiac resynchronization therapy (CRT) devices have included pulse generators to provide the electrical stimulus and either transvenous or epicardial leads to deliver the stimulus to the heart. However, additional novel devices have been developed which operate effectively without the requirement for a transvenous or epicardial lead system; leadless pacemakers are transcutaneous placed directly inside the heart, while subcutaneous ICDs and implantable loop recorders function effectively in a pocket without direct attachment to the heart. The clinical presentation and management of CIED infections vary according to the location and extent

of infection and the clinical characteristics of the patient. One of the most common complications documented for BIV (biventricular) ICD has been infections resulting in an 8.4-11.6-fold increase in mortality rates [1]. Prior studies have shown that implantation of leadless pacemakers is safe and feasible in patients with recent cardiac implantable electronic device (CIED) lead infections [2]. CIED infections are generally considered in two categories: pocket infection and systemic infection. However, these categories are not mutually exclusive, and the two forms may coexist.

2. Case Presentation

Our patient is a 53-year-old male with history of non-ischemic reduced congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), immune thrombocytopenia and unprovoked pulmonary embolism. Patient also has extensive history of non-compliance, cardiac procedures and substance abuse including IV methamphetamine use. In 2017, patient had a ABT BIV ICD inserted after being diagnosed with reduced ejection fraction heart failure. Later in 2017, he also underwent AV node ablation. Patient also had repeated lead placement revision as he continued to twiddle with his leads and had dislodged his RV (right ventricle) lead. In early 2019, he then underwent a lead-less single chamber Micra pacemaker placement after having developed a complete heart block. In addition, patient has also had recurrent admissions regarding to CHF exacerbation, septic shock, arrhythmia and COPD exacerbation. During these admissions, his previous blood cultures have grown Methicillin-sensitive Staph Epidermis.

Patient was admitted for chest pain and shortness of breath that had been progressively worsening over the past few days. He had also reported that his ICD may be misfiring. However, twenty minutes after admission, he suddenly developed cardiac arrest with ventricular fibrillation. He was resuscitated, and then intubated. After being shifted to the ICU, patient had another two episodes of cardiac arrest, both with ventricular fibrillation. He was shocked once and then started on amiodarone and lidocaine drip. There was concern his ICD was shocking him. Lab work including urine drug screen was unequivocal. Chest x-ray revealed a developing right lower lobe pneumonia, concerning for potential aspiration pneumonia. IV Unasyn was started. Interrogation of the ICD revealed that it had been misfiring, upon which it was de-activated. After discontinuation of amiodarone and lidocaine, patient was then taken to the cath lab for ICD removal. Initial attempts at extubation were unsuccessful, and during one attempt, patient seemed to have suffered a seizure. Keppra was started, and neurology was consulted. EEG was negative for seizures while a head CT was negative for any acute changes.

As his clinical condition improved, patient was subsequently extubated. Initial blood cultures grew Methicillin-sensitive Staph Epidermis, now raising concern for pacemaker-induced endocarditis. Patient's subsequent set of blood cultures were negative to growth. We then ordered a transthoracic echocardiogram, which revealed an ejection fraction of 30-35%, but no vegetations. Transesophageal echocardiogram was deemed as unnecessary as staph

epidermidis has low probability of inducing vegetations. Micra pacemaker device was then removed. Infectious Disease recommended that patient could be treated with penicillins or cephalosporins. IV Unasyn was continued for 20 days and then later transitioned to Rocephin. Patient discharged home with a Life Vest and with instructions to continue antibiotics for 6 weeks and then to follow-up appropriately with Cardiology in the future for re-implantation of defibrillator device 8 weeks after completion of antibiotics.

3. Discussion

CIED systemic infection refers to an infection involving the transvenous portion of the lead, usually with involvement of the contiguous endocardium or tricuspid valve, or an epicardial electrode with involvement of the epicardium. CIED systemic infection can occur with or without involvement of the generator pocket. Patients with systemic infection generally have positive blood cultures and/or vegetations on TEE. The diagnosis of CIED systemic infection should be suspected in patients with CIED who present with fever or other systemic symptoms, with or without overt pocket infection, pulmonary nodular infiltrates (eg, suspected septic emboli), or unexplained bacteremia. The diagnosis may be established in patients with CIED and fever or systemic symptoms in the setting of the following diagnostic findings such as clinically evident pocket infection and positive blood cultures (S. aureus or Coagulase-negative staphylococci), Culture and histopathology of the vegetation/lead tip, TEE with valve or lead vegetation.

At least two or three sets of blood cultures should be obtained from separate venipuncture sites prior to initiation of empiric antimicrobial therapy [1]. Follow-up blood cultures should be obtained 48 to 72 hours after antimicrobial therapy is begun and repeated every 48 to 72 hours until clearance of bacteremia is documented. Echocardiography, preferably TEE, should be performed promptly in all patients with suspected device infection [2]. TEE is superior to transthoracic echocardiogram (TTE) for detection of vegetations and allows assessment of the lead in the proximal superior vena cava. In several studies, TEE identified vegetations on the tricuspid valve or device lead in 90 to 96 percent of patients with endocarditis; in contrast, TTE identified such findings in only 22 to 43 percent [3, 4]. However, the sensitivity of TEE is not 100 percent, so a negative study does not rule out the diagnosis of CIED-related or independent endocarditis. Given that the TEE is not 100 percent sensitive for the detection of endocarditis, some patients with high-grade bacteremia due to typical endocarditis-causing organisms and a negative TEE will satisfy the modified Duke criteria for possible endocarditis and should be treated accordingly.

It is of rare instance to find a combination of BIV ICD and leadless pacemaker present in a patient simultaneously. Given that our patient was having lead capture issues, a Micra pacemaker was subsequently added in addition to his BIV ICD. There are no guidelines in order to manage a combination of CIED and leadless pacemakers in settings of suspected endocarditis due to bacteremia. In our case, the BIV ICD was removed and the patient opted for re-implantation of a BIV ICD after the infection had cleared despite having a Micra leadless pacemaker present.

4. Conclusion

Even though infections continue to be one of the primary complications of CIED many patients continue to depend on these devices to assist with their cardiovascular morbidities. With the rise of new leadless pacemakers more investigation needs to be carried out to have clear cut guidelines to successfully manage cases of bacterial endocarditis in the setting of leadless pacemakers. This case presents a unique teaching point that early recognition of pacemaker lead infections requires high index of suspicion to help reduce mortality related to pacemaker lead infective endocarditis.

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Conflict of Interest Statement

The 3 authors: Khalid Sawalha MD, Shoaib Khan MD, Krishna Vedala MD, MPH wish to declare there is no conflict of interest.

Ethics Approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed Consent

Verbal consent was obtained directly from the patient.

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