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Case Report

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Corynebacterium striatum Cardiac Device-Related Infective Endocarditis: The First Case Report in a Patient With a Cardiac Resynchronization Therapy Defibrillator Device and Review of the Literature

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Abstract

Corynebacterium striatum (*C. striatum*) is a skin commensal agent, rarely described as a cause of infective endocarditis. We describe a case of a 48-year-old man, with multiple comorbidities with cardiac resynchronization therapy defibrillator (CRT-D) device implanted 1 year before. A cardiac device-related infective endocarditis (CDRIE) due to *C. striatum,* with vegetations in the tricuspid valve adjacent to the electrode lead and concomitant lumbar spondylodiscitis were diagnosed. The patient was treated initially with a 6-week course of vancomycin with sterile blood cultures and reduction of inflammatory parameters. Surgery was refused at this stage. Six weeks later, he was readmitted due to *C. striatum* bacteriemia recurrence, with vegetations adhering to the electrode wire, being treated with daptomycin 10mg/kg body weight, after presenting renal toxicity to vancomycin. CRT-D device was removed with implantation of epicardial cardiac resynchronization therapy pacemaker (CRT-P). To our knowledge, this might be the first description of *C. striatum* CDRIE in a patient with a CRT-D. In the five cases described in the literature of CDRIE by this agent, early removal of the pacemaker was performed with good results. In this case, the device was removed only after failure of medical treatment alone.

Keywords: Infective endocarditis; *Corynebacterium striatum*; Cardiac device-related infective endocarditis; Cardiac resynchronization therapy defibrillator; Implantable cardioverter defibrillator; Daptomycin

Introduction

Corynebacterium striatum (*C. striatum*) is an aerobic and optional anaerobic gram-positive bacillus, commensal from the skin. In the last decades *C. striatum* is becoming an emerging agent, a multidrug-resistant pathogen with the capacity to form biofilms that can cause infection of endovascular devices [1].

Cardiac device-related infective endocarditis (CDRIE) is defined as an infection extending to the electrode leads, cardiac valve leaflets, or endocardial surface that can result either from pocket infection extending to intracardiac electrodes, or any portion of the device may become infected due to secondary bacteremia resulting in the formation of vegetations. The latter can be found anywhere from the insertion vein to the superior vena cava, on the lead, tricuspid valve, in the right atrial or ventricular endocardium [2]. The presence of infective material along the lead course may not provide typical vegetations of measurable size so that normal transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) do not rule out CDRIE [2]. Treatment includes both prolonged antibiotic therapy associated with complete hardware removal [2]. *Corynebacterium spp.* is rarely identified as a pathogen in CDRIE infection [2]. A literature search in PubMed revealed only five case reports of *C. striatum* CDRIE [3-7]. Although an increased risk of CDRIE has been described in patients with implantable cardioverter-defibrillators compared with permanent pacemakers [2], all cases described in the literature refer to pacemaker patients, this case being the first case description of CDRIE by *C. striatum* in a cardiac resynchronization therapy defibrillator (CRT-D) patient. On the other hand, in all cases described in the literature [3-7], the pacemaker was removed in the first inpatient days, with a good outcome despite the patient's age and comorbidities. In this case, due to the patient's poor performance status and comorbidities, the surgical intervention was refused at first. The patient was managed with medical treatment only, but despite clinical improvement, he had recurrence of the infection a few weeks later. The device was removed only on the second CDRIE by the same agent with a good outcome despite the patient's overall condition.

Case Report

We present the case of a diabetic 48-year-old man with non-ischemic dilated cardiomyopathy, associated with heart failure

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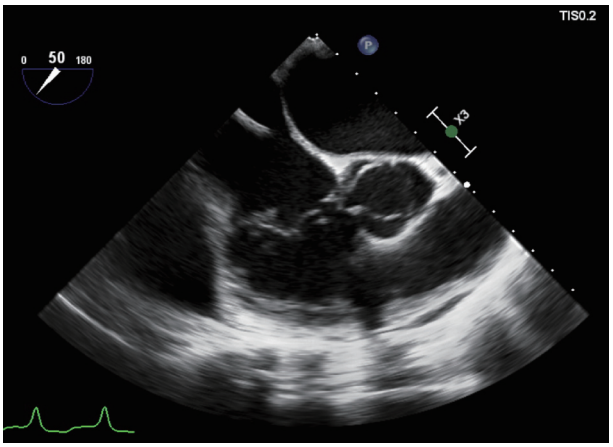

Figure 1. Transesophageal echocardiogram showing the vegetation adherent to the posterior leaflet of tricuspid valve. This exam was unremarkable for fibrin-sheath, masses or vegetations adherent to the electrocatheter.

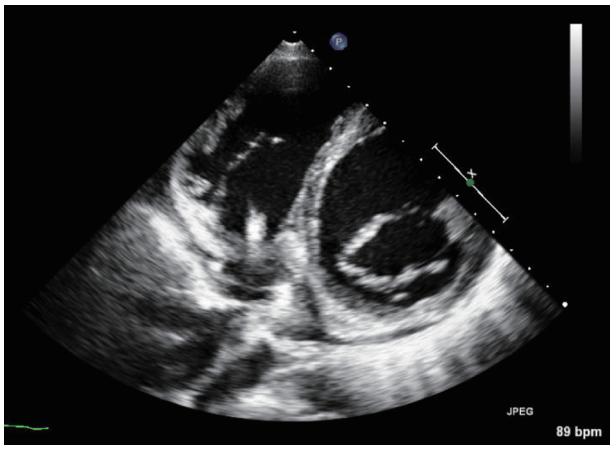

Figure 2. Parasternal short-axis mitral valve unconventional view displaying *de novo* fibrin-sheath involving the electrocatheter with an additional punctiform image.

with severely reduced ejection fraction, complete heart block (CHB), and permanent atrial fibrillation. The patient had a past cardioembolic stroke with left hemiparesis and had a record of recurrent urinary tract infections (UTIs) associated with suprapubic cystostomy due to urethral stenosis. A CRT-D generator (Quadra Assura MP St Jude Medical) was implanted the year before due to CHB with a single lead pacing cardioverter-defibrillator implanted (ICD), due to QRS < 120 ms and high probability of widening in the near future.

One month earlier he was admitted in the emergency department (ED) for fever and low back pain, being discharged with a UTI diagnosis and ciprofloxacin.

Again, he was admitted in the ED with fever, severe low back pain, anorexia, and weight loss. On physical examination, fever (39.1 °C), painful palpation of the lumbar spinal apophysis, and absent cardiac audible murmur, or cutaneous embolic phenomena were remarked. Electrocardiography showed atrial fibrillation with complete left bundle branch block with QRS > 150 ms, and TTE was unremarkable for the presence of vegetations. Prior blood cultures (BC) identified *C. striatum*, with sensitivity to tetracycline and vancomycin, and resistance to gentamicin, clindamycin, ciprofloxacin, and penicillin G; so did a new pair of BC with the same sensitivity profile. Vancomycin therapy was initiated. BC collected on the second day of antibiotic was sterile. Ten days after admission TEE showed vegetation at the auricular face of the tricuspid valve, in the posterior leaflet, +/- 6 mm, heterogeneous contours, with two mobile projections with +/- 6 mm, with no apparent device lead involvement (Fig. 1).

Lumbar computed tomography (CT) scan showed irregularities in the L1 - L2 vertebral platforms, which were absent in the previous examination, 1 month earlier. Due to the incompatibility of the CRT-D device, it was not possible to perform magnetic resonance imaging (MRI). However, a lumbar spondylodiscitis diagnosis was presumed.

TEE was repeated (day 29) in the fourth week of vancomycin therapy, similar to the previous one namely regarding the presence of vegetation. Surgical removal of the CRT-D device was proposed, but the patient was considered as having a very high overall surgical risk. So he was managed with medical treatment alone. He was discharged after completing 49 days of vancomycin, with clinical resolution and serial negative blood cultures.

Again, 42 days after hospital discharge, the patient was readmitted, in cardiogenic shock, with respiratory failure, acute kidney injury, and ischemic hepatitis requiring dobutamine. As soon as dysfunctions improved he was transferred to our nursery. Again, BC showed the presence of *C. striatum*, with the same sensitivity profile and presumptively sensitive to daptomycin (minimum inhibitory concentration (MIC) = 0.023 µg/mL). Neither TTE at admission nor TEE performed 5 days after, showed cardiac vegetation. Vancomycin was started (day 3), requiring several adjustments due to frequent toxic levels. The patient developed acute kidney injury (day 12) suspecting renal toxicity due to vancomycin; and therapy was changed to daptomycin10 mg/kg. A systolic murmur not present at admission was noticed (day12), and TTE was repeated with evidence of vegetations adhering to the device lead in its auricular path near the tricuspid valve (Fig. 2). Daptomycin therapy was continued without new febrile events or elevated inflammatory markers, and with sterile serial BC. On the 81st day of daptomycin (inpatient day 93), the patient underwent surgical intervention with the removal of CRT-D and implantation of a cardiac resynchronization therapy pacemaker (CRT-P) (Quadra Allure MPP St Jude Medical), with epicardial electrodes and the device placed in an abdominal *loca*. ICD was not implanted due to the absence of therapies in the past, in addition to frailty and life expectancy < 1 year. Electrode tips were sterile. He completed 15 days of daptomycin after the intervention. No evidence of recurrence of infection was found in follow-up consultation 6 months after discharge.

Discussion

Although *C. striatum* is commensal from the skin, it is becom-

Table 1. Literature Review of Case Reports of *Corynebacterium striatum* Cardiac Device-Related Infective Endocarditis

Ref.	Gender, age	Comorbidities	Cardiac devices	IE location (and other infected locations associated)	TTE and TTE findings	Cultures positive to *C. striatum*	Antibiotic susceptibility testing reveling sensitivity (MIC, in µg/mL)	Medical treatment	Surgery	Outcome
[3]	M, 73	ND	Pacemaker (6 years before, with battery replacement 2 years before without removal of old electrode wire)	Intracardiac lead and tricuspid valve (pacemaker sinus tract)	TTE: normal; TEE: vegetations on the old electrode wire	BC; drainage pus	Vancomycin (ND)	1) Vancomycin (4 weeks); 2) Co-trimoxazole + rifampin (4 weeks); 3) Vancomycin (4 weeks)	Yes (1st intervention: removal of pacemaker battery; 2nd intervention: removal of old electrode wire)	Alive
[4]	F, 71	ND	Pacemaker (replaced 2 months before)	Intracardiac lead (ND)	TTE: mobile mass adherent to the intracardiac lead	Device	Vancomycin (0.5)/ linezolid (0.25)/ daptomycin (0.125)	1) Daptomycin 6mg/kg body weight (7 days); 2) Linezolid; 3) Daptomycin (4 weeks)	Yes (8th day, device removal, and reimplantation of a new pacemaker)	Alive
[5]	M, 51	ND	Pacemaker (7 months before)	Pacemaker intraatrial lead (ND)	TEE: vegetations intracardiac wire	BC; device	Penicillin (ND)/ gentamicin (ND)/ tobramycin (ND)/ erythromycin (ND)/ lincomycin (ND)/ linezolid (ND)/ chloramphenicol (ND)/tetracycline (ND)/rifampicin (ND)/co-trimoxazole (ND)/ofloxacin (ND)/ teicoplanin (ND)/ vancomycin (ND)	1) Vancomycin + ciprofloxacin (6 weeks)	Yes (device removal)	Alive
[6]	M, 78	Diabetes, chronic renal failure	Pacemaker (6 months before)	Pacemaker intraventricular lead and tricuspid valve (spondylodiscitis D10 - D11 and epidural abscess)	TTE: mobile masses adherent to the intracardiac lead from the tricuspid valve to the right ventricular wall.	BC	Daptomycin (0.064)/ vancomycin (0.36)	1) Daptomycin 10 mg/kg	Yes (10th day removal of electrode wires followed by re-implantation of new wires 9 days later)	Alive
[7]	F, 79	ND	Pacemaker (7 years before)	Pacemaker lead (ND)	TTE: normal; TEE: normal	BC; device	ND	1) Vancomycin (6 weeks)	Yes (pacemaker removal due to dysfunction)	Alive

BC: blood cultures; D: in-patient day; F: female; IE: infective endocarditis; M: male; MIC: minimum inhibitory concentration; ND: not described; Ref.: reference; TEE: transesophageal echocardiography; TTE: transthoracic echocardiography.

ing an emerging infectious agent, a multidrug-resistant pathogen with the capacity to form biofilms [1]. In the presence of bacteriemia and cardiac devices, CDRIE should be suspected even in the absence of typical vegetations in the TTE and TEE [2]. The treatment combines prolonged antibiotic therapy and device removal [2].

Corynebacterium spp. is rarely identified as a pathogen in infective endocarditis [2], and there are only five case reports of *C. striatum* CDRIE whose characteristics are summarized in Table 1 [3-7]. Most of them (4/5) were treated with vancomycin and all of them with device removal within the first inpatient days. In the case of our patient, despite the assumption of resolution of the bacteremia, clinical improvement, and a 6 weeks course of antibiotics, on the first hospitalization, the infection was not resolved with medical treatment alone with recurrence of bacteremia imposing the withdrawal of CRT-D despite the high surgical risk.

Regarding medical treatment, daptomycin 10 mg/kg body weight for 6 weeks was successfully used in one case described by Guerrero et al [6], in which spondylodiscitis also coexisted, as in the case of our patient.

It should be noted that only in one of the described cases, vegetations were detected in the TTE, being the TEE necessary to confirm the diagnosis in most cases. Since *C. striatum* is a pathogen capable of forming biofilms, in the presence of bacteremia and endovascular devices, the suspicion for infection should be high and the diagnosis must be pursued, as shown by Szymanska et al [7].

This case demonstrates that in the presence of CDRIE the removal of the device is fundamental to treatment's success and must be pursued to control infection source. On the other hand, it shows that daptomycin is a suitable option for the treatment of infective endocarditis by this pathogen.

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None to declare.

Financial Disclosure

None to declare.

Conflict of Interest

None to declare.

Informed Consent

Both written and verbal informed consents were obtained from the patient for publication of this case report.

Author Contributions

LSP collected the case data, wrote the manuscript, and prepared the table; ADF collected the case data, prepared the pictures, and wrote the manuscript; MF collected the case data and revised the manuscript. All authors approved the final version to be published.

Data Availability

The authors declare that data supporting the findings of this study are available within the article.

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