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Delayed Pacemaker Generator Pocket and Lead Primary Infection Due to *Burkholderia Cepacia*

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Patient: Female, 70
Final Diagnosis: Pacemaker pocket and lead infection with bulkhorderia cepacia
Symptoms: Swelling over parotid region
Medication: —
Clinical Procedure: Removal of pacemaker
Specialty: Infectious Diseases

Objective: Rare disease

Background: Recently, the use of cardiac implantable electrophysiological devices (CIEDs) has increased. Advances in medical technology, an increasingly aging population, increases in clinical indications, and expanded medical insurance coverage for these devices have all contributed to this trend. Infection is considered to be one of the most serious complications of CIEDs and carries a significant risk of morbidity and mortality. Although infection with *Staphylococcus sp*. accounts for the majority of cases, other bacteria have been implicated as causative agents of infection of CIEDs.

Case Report: We report the first case of primary pacemaker generator pocket and lead infection due to *Burkholderia cepacia (B. cepacia)* in the state of Qatar. To our knowledge, there have been few cases of CIED infection due to *B. cepacia* previously reported in the literature.

Conclusions: This case raises awareness of *B. cepacia* as a potential opportunistic pathogen in CIED infection. The more rare bacteria require culture on special media to provide an early diagnosis to enable proper antimicrobial therapy to commence. Adherence to infection control standards during CIED insertion would reduce infection from *B. cepacia*.

MeSH Keywords: *Burkholderia Cepacia* • Cardiac Resynchronization Therapy Devices • Defibrillators, Implantable • Heart Valve Prosthesis Implantation • Pacemaker, Artificial

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/904435

Background

Opportunistic infection of cardiac implantable electrophysiological devices (CIEDs) CIED is a serious complication that is still on the rise despite the use of prophylactic antibiotics and the application of strict infection control measures [1,2]. Multiple risk factors, such as diabetes, hypertension, chronic renal failure, and coronary artery disease, have been reported to increase the risk of CIED infection [3].

The major causative organisms associated with CIED infection are *Staphylococci* followed by Gram-negative bacilli, fungi and non-tuberculous mycobacteria [3]. *Burkholderia cepacia* (*B. cepacia*) bacterial complex is a rare cause of CIED infection with only a few cases of pacemaker pocket infection reported in the literature [4]. *B. cepacia* is usually a nosocomial organism causing opportunistic infection in immunocompromised individuals [5]. The bacteria have low virulence, a high ability to survive for prolonged periods of time in the environment, and they are frequent colonizers of fluids used in hospitals [5]. Also, *B. cepacia* can grow as biofilms causing infection in patients with implanted devices [5].

Case Report

A 70-year-old woman presented to the emergency department with a two-day history of swelling, redness, and pain at the site of her cardiac pacemaker pocket. She had history of diabetes and hypertension, and in 2003, she had suffered from a myocardial infarction. The patient had a subcutaneous left pre-pectoral implantation of a pacemaker 11 months prior to her current presentation, but the reason for this was unclear, as her previous medical records from another country were unobtainable.

Physical examination on admission showed swelling, erythema, warmth, and tenderness at the site of pacemaker pocket without dehiscence or discharge. Laboratory findings were as follows: white blood cell count (WBC) of 8.5×10^9/L (reference range 4.0–10.0×10^9/L); hemoglobin (Hb) 13 gm/dL (reference range 12.0–15.0 gm/dL); platelets 312×10^3/μL (reference range 150–400×10^3/μL); HbA1c 7.8% (reference range 4.8–6.0%); ESR 10 mm/h (reference range 0–29 mm/hr); C-reactive protein 5 mg/L (reference range, 0–5 mg/L). Tests of renal function, liver function, and blood coagulation profile were within normal range. Procalcitonin, a marker of sepsis, was 0.04 ng/ml (<0.5 ng/ml low risk of severe sepsis; >2.0 ng/ml high risk of severe sepsis). Three sets of blood cultures were negative. Trans-thoracic echocardiography was normal.

The diagnosis of superficial infection at the pocket site was considered, based on the clinical presentation and findings by the emergency room physician. The patient was started empirically on oral Augmentin, 1 gm twice daily, and discharged home. The patient was not referred to infectious diseases, cardiology or electrophysiology subspecialties for evaluation and management. Two weeks later, the patient returned with worsening swelling, pain, and redness without discharge or fever. However, at this time, the patient was seen by infectious disease, electrophysiology, and cardiology teams. Repeated routine blood workup and blood cultures were again negative. A left upper chest ultrasound was performed and showed a collection at the pacemaker pocket measuring 5.6×1.7×3.6 cm in size (Figure 1). A trans-esophageal echocardiography was performed. The pacemaker wire was visualized in position at the right atrium and right ventricle without any masses or vegetations attached to it. The patient was started empirically on vancomycin 20 mg/kg every 8 hours, cefepime 2 gm every 8 hours, and rifampicin 450 mg twice daily without improvement. Both the generator and wires were removed after two weeks of antibiotic treatment. Five days later, culture from the pocket pus and pacemaker lead grew *B. cepacia* on blood agar, which was confirmed by full molecular identification using matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS). *B. cepacia* was sensitive to trimethoprim-sulphamethoxazole, levofloxacin, meropenem, and ceftazidime.

A diagnosis of pocket and lead pacemaker infection by *B. cepacia* was made. We stopped vancomycin, cefepime and rifampicin. The patient had a history of sulfa allergy, so she was treated with intravenous ceftazidime 2 gm every 12 hours for six weeks. She was also revaluated by electrophysiology team and pacemaker reinsertion was advised, but the patient refused and decided to be treated medically. The patient made a complete recovery at the end of treatment. Long-term follow-up was not possible as the patient then returned to her home country.

Discussion

Cardiac implantable electrophysiological devices (CIED) include all permanent pacemakers and implantable cardioverter-defibrillators (ICDs). The clinical indications for the use of CIEDs have increased over the last few decades with the advances in cardiac electrophysiology and increase in life expectancy [1]. CIED implantation may be associated with complications, of which, infection is considered to be a major complication that carries considerable morbidity, mortality, and significant financial burden to healthcare systems [2,3].

CIED of infection is defined as the presence of either local signs of inflammation at the generator pocket site, or the presence of lead or valvular vegetations, including the Duke criteria for

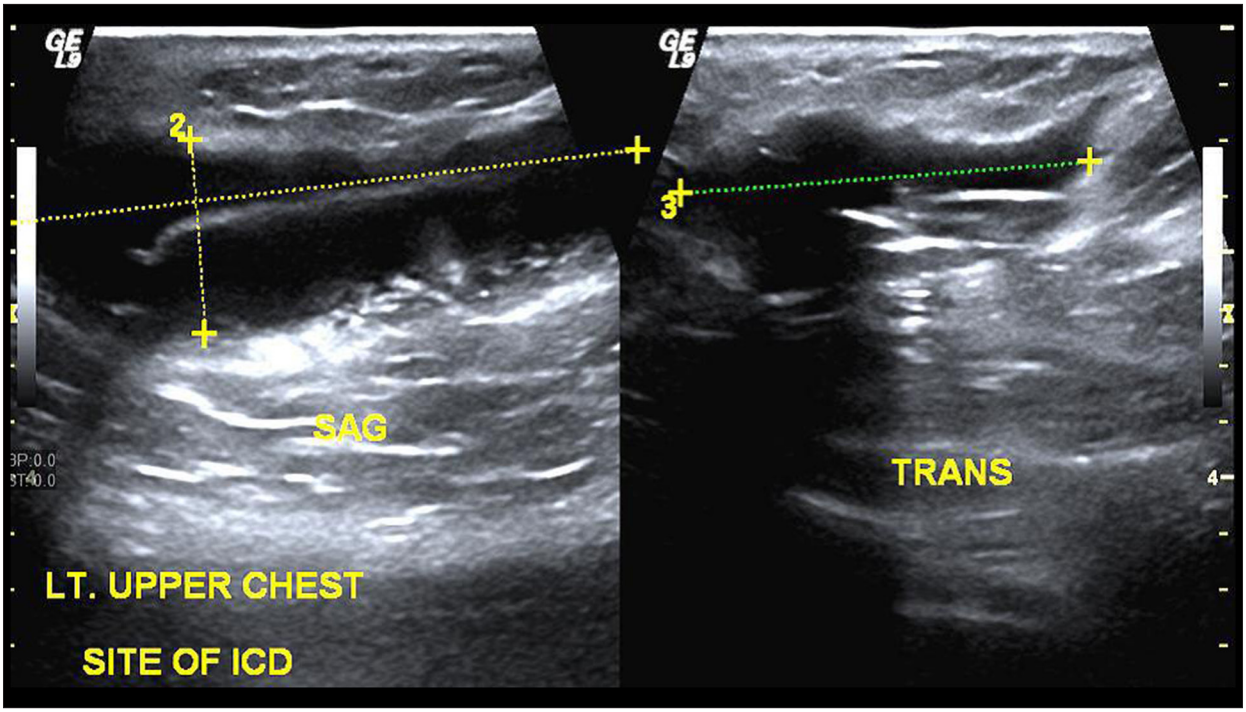

Figure 1. Ultrasound image of the left upper chest to include the pacemaker generator site A thick anechoic area is seen suggestive of a collection within the subcutaneous plane at the left upper anterior chest wall region, measuring 5.6×1.7×3.6 cm in size, with a volume of approximately 18 ml.

infective endocarditis [3–5]. Our patient had pocket and lead infection without bacteremia. The incidence of pacemaker-related infection is greatest among cases of abdominal implantation, which can be as high as 19.9%, and lowest with pre-pectoral implantation, with infection rates of 0.13% [6]. Despite improved surgical techniques and the use of infection control measures as well as antibiotic prophylaxis, the frequency of CIED infections is increasing disproportionately to the rate of implantation [1,2]. For example, there was a 42% increase in the rate of CIED implantation between 1990 and 1999 accompanied by a 124% infection rate [1,2]. This finding was most likely attributed to the increase in the incidence of major comorbidities.

Several risk factors can play an important role in the development of CIED infection [3]. Patient factors, including the presence of diabetes mellitus, heart failure, and renal dysfunction have the strongest association with CIED infection [3,6,7]. Our patient had underlying diabetes mellitus, which could have been the main underlying risk factor for her CIED infection. In addition, peri-operative factors, such as the lack of antibiotic prophylaxis prior to device implantation, temporary pacing prior to permanent device placement, the presence of fever within 24 hours of implantation, operator inexperience, and prolonged operative time, can also increase the risk of infection [6]. Furthermore, device factors that can be associated with increased risk of infection, and include abdominal generator placement, the presence of more than two electrodes leads, epicardial lead placement, multiple previous device revisions, and a previous history of CIED infection, are risk factors for infection [6]. Device contamination could be primary, when the device and/or pocket itself is the source of infection during implantation, or secondary, due to bacteremia from a distant source [8]. A recent study showed that 25% of infections were early (less than 28 days), while 33% were delayed (29–362 days) and 42% were late (more than 365 days); there was no difference in the type of infective organism [8]. Our patient had primary delayed pacemaker infection that was most likely to have been contaminated during the insertion.

The major causative organisms associated with CIED infection are *Staphylococci*, accounting for up to 80% of all CIED infections [8]. Gram-negative bacilli, other Gram-positive cocci, multiple bacteria and fungal organisms including *Aspergillus* are much less common, found in 9%, 4%, 7%, and 2% of cases, respectively [9–12]. Non-tuberculous *Mycobacteria* are rarely identified as a cause of CIED infection (0.2%) [13]. *B. cepacia* has been reported in a case report of prosthetic valve endocarditis and a case report of pacemaker pocket infection [4,14]. Outbreaks of nosocomial infections had been related to contamination with *B. cepacia* of irrigation solutions, intravenous fluids, ultrasound gel, antiseptics, and disinfectants [15,16]. Also, these bacteria have the ability to grow as biofilms causing infection in patients with implanted devices [5]. Unfortunately,

we were not able to get any details of CIED implantation in our patient, whether there was any lack of infection control measures and what antibiotic was given prior to the procedure. We assume that this patient became colonized by *B. cepacia* during the time of device implantation, which presented as infection 11 months later.

The management of CIED infection includes a combination of long-term administration of appropriate antibiotics and full device extraction [6]. Because *Staphylococci* and *Streptococci* are the most common causative organisms for CIED infection, vancomycin is usually the drug of choice and is given empirically until final identification and sensitivity of the organism are known [6]. However, other unexpected bacteria are occasionally encountered, as in this case presentation. The treatment for *B. cepacia* can be challenging because it has a complex intrinsic resistance to several antibiotics. *B. cepacia* is mainly susceptible to trimethoprim-sulphamethoxazole, carbapenems (meropenem), cephalosporines (ceftazidime), ticarcillin and quinolones (ciprofloxacin) [17]. The treatment of choice for *B. cepacia* infection is trimethoprim-sulphamethoxazole, which was not given to our patient because of her allergy to the drug. Instead, we decided to treat her with ceftazidime, which cleared the infection.

A patient reported in a previously published case of *B. cepacia* infection was an elderly man, without underlying comorbidities, who developed CIED pocket infection with *B. cepacia,* 20 days after CIED implantation [4]. In this previous report, the device was removed and the patient was treated with levofloxacin, cefolazone/sulbactam sodium, and imipenem [4]. Our patient responded very well to a single antibiotic, for which *B. cepacia* showed esnsitivity. We do not believe that there is a need for a combination of multiple antibiotics once bacterial typing and sensitivity have been confirmed, to prevent future microbial antibiotic resistance.

Conclusions

Awareness is needed among primary healthcare physicians to avoid delay in diagnosis and mismanagement of CIED-associated infection, including rare opportunist infection. Bacterial cultures may require special media to reach an early diagnosis and to start appropriate antimicrobial therapy. This case report has been presented to raise awareness of *B. cepacia* as a potential pathogen in CIED infections.

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Conflict of interest

None of the authors has any conflict of interest from publishing this manuscript

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