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Case report

Prevotella bivia cardiac implantable electronic device related endocarditis

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ABSTRACT

Cases of Gram-negative, anaerobic rod bacteremia and endocarditis have been increasingly recognized in recent years. This increase has been primarily observed in patients at risk for polymicrobial infections, such as those who use injection drugs and patients with diabetes mellitus. Despite a growing incidence, there are few published case reports of cardiac implantable electronic device related endocarditis secondary to Gram negative, anaerobic organisms. We present a unique case of *Prevotella bivia* cardiac implantable electronic device related endocarditis in a middle-aged woman with no history of injection drug use. This case highlights the increasing incidence of polymicrobial infections and anaerobic endocarditis. Additionally, it demonstrates how *Prevotella bivia* has the potential to cause native valve infective endocarditis as well as cardiac implantable electronic device related endocarditis.

Learning objective

The recent increase in polymicrobial infections has led to an increase in anaerobic bacteremia and infective endocarditis. *P. bivia* has the potential to cause native valve endocarditis and hematogenously seed cardiac devices. *P. bivia* is a rare but serious cause of Gram-negative, anaerobic rod cardiac implantable electronic device related endocarditis. Unfortunately, increasing antimicrobial resistance patterns complicates the treatment of these Gram-negative, anaerobic rods.

Introduction

Cardiac implantable electronic device (CIED) related endocarditis is a rare but life-threatening condition that is associated with significant morbidity, prolonged hospitalizations, and high financial costs [1,2]. Unfortunately, the incidence of CIED related infections has increased out of proportion to the rate of pacemaker and implantable cardiac defibrillator (ICD) placements [2–5]. According to Tarakji et al., the rate of CIED related infections following primary implantation is approximately 0.5%, while the rate of infections following secondary interventions can be as high as 7% [2]. The most common organisms associated with CIED related endocarditis are *Staphylococcus* genus, most notably *Staphylococcus aureus* and coagulase-negative *Staphylococcus* [2,6]. More recently, there has been an increase in Gram-negative, anaerobic rod bacteremia and infective endocarditis [7,8]. According to Brook, infectious endocarditis secondary to anaerobic bacteria accounts for approximately 2–16% of infective endocarditis cases. The growing incidence of Gram-negative, anaerobic rod infective endocarditis has been attributed to a rise in polymicrobial infections, primarily in patients who use injection drugs [7]. Despite this rise, CIED related endocarditis secondary to Gram negative, anaerobic organisms remains rare. We present a unique case of Gram-negative, anaerobic rod tricuspid valve and CIED related endocarditis secondary to *Prevotella bivia* (*P. bivia*).

Case report

Investigations

A 60-year-old female presented to the emergency department with four-day history of back pain after falling secondary to leg weakness. She denied loss of consciousness, head injury, or any preceding symptoms. She complained of persistent, sharp back pain radiating across her lower back. On further questioning, she reported multiple similar falls due to weakness and feeling as though her legs were giving out. She also noted a recent sore throat, earache, chills, and a mildly productive cough. Her medical history was significant for atrioventricular node dysfunction requiring dual-chamber pacemaker placement, hypercoagulable state with prior pulmonary emboli, type two diabetes mellitus, and hypertension.

Abbreviations: CIED, cardiac implantable electronic device; ICD, implantable cardiac defibrillator; CT, computed tomography

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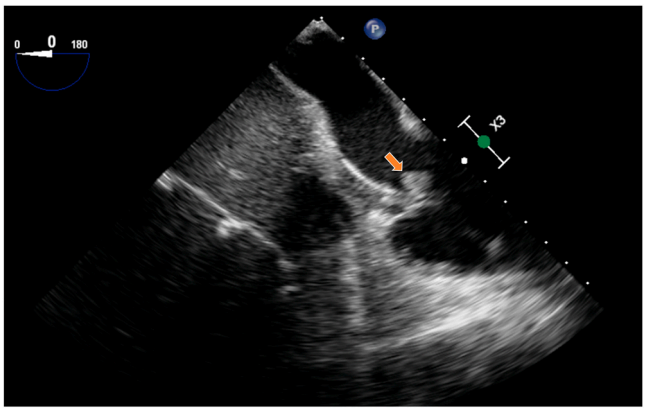

Fig. 1. Tricuspid valve vegetation on transesophageal echocardiogram.

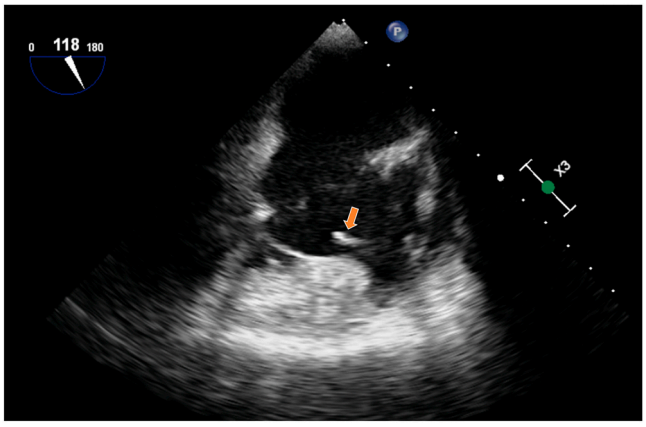

Fig. 2. Vegetation on right ventricular pacemaker lead on transesophageal echocardiogram.

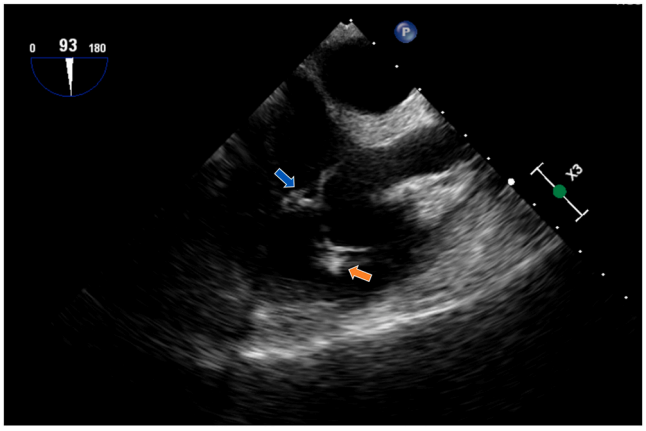

Fig. 3. Vegetation on tricuspid valve and vegetation on right ventricular pacemaker lead on transesophageal echocardiogram.

On initial examination, she appeared ill but in no acute distress. Her blood pressure was 102/51 mm Hg, heart rate 72 beats per minute, temperature 97.2 degrees Fahrenheit, and she was breathing 16 breaths per minute with an oxygen saturation of 100% on room air. Pertinent exam findings included a 2/6 systolic murmur best heard over the lower left sternal border and moderate right lumbar paraspinal tenderness which was reproducible with hip flexion. Dental examination revealed overall poor dentition with multiple dental caries. Relevant laboratory findings included a lactic acid of 2.9 mmol/L (reference range: 0.5–2.2 mmol/L), procalcitonin of > 100 (reference range: 0.00–0.50 ng/mL), platelet count of 57 (reference range: 150–450 K/uL), and a creatinine of 1.44 (reference range: 0.57–1.00 mg/dL). Initial blood cultures demonstrated growth of Gram-positive cocci in chains. Computed tomography (CT) scan of the lumbar spine with contrast demonstrated a small abscess in right psoas muscle. Transthoracic echocardiogram followed by transesophageal echocardiogram demonstrated a mobile echodensity attached to the tricuspid valve and a mobile echodensity on the pacemaker lead in the right ventricle concerning for endocarditis (Figs. 1–3).

Diagnosis

Her positive blood cultures and echocardiogram findings confirmed infective endocarditis. She was prescribed empiric antimicrobials: vancomycin and cefepime. Cardiology and Infectious Diseases were consulted. Initial blood cultures ultimately grew *Streptococcus agalactiae* (Group B streptococcus), and antibiotics were de-escalated to ceftriaxone. Following pacemaker extraction and temporary pacing wire placement, the patient became hypotensive and required transfer to the cardiovascular intensive care unit for hemodynamic support with vasopressors. Interestingly, the cultures of her cardiac device as well as her repeat blood cultures demonstrated growth of Gram-negative, anaerobic rods, which were not present on initial blood cultures. Given her acute decompensation in the setting of polymicrobial bacteremia her antibiotics were broadened to meropenem. The Gram-negative rods were later identified as *Prevotella bivia.*

Treatment

With new findings of *P. bivia* CIED related endocarditis and her known *Streptococcus agalactiae* bacteremia, antimicrobial therapy was changed to ertapenem. She underwent placement of a new pacemaker device upon clearance of her *P. bivia* bacteremia without complications. Her right psoas muscle abscess was evaluated by Interventional Radiology and deemed too small for percutaneous drainage.

Follow-up and outcomes

She was safely discharged home with home health. She completed a 6-week course of intravenous ertapenem and has followed up regularly without complications or adverse events.

Discussion

The diagnosis and management of Gram-negative, anaerobic rod endocarditis is poorly characterized in the literature and has remained a challenge for many healthcare professionals [8,9]. Currently, *Bacteroides fragilis* is the most common Gram-negative, anaerobic rod causing infective endocarditis [7]. However, as the number of polymicrobial infections increases, so does the diversity of anaerobic organisms causing infective endocarditis. Initial studies demonstrate that patients with anaerobic endocarditis have both higher mortality rates (21–43%) and a higher incidence of thromboembolic events compared to those with aerobic infections [7,10,11]. However, more recent studies argue that patients with nonstaphylococcal CIED-related endocarditis, including Gram-negative, anaerobic rods, have relatively low virulence and mortality rates [12]. These discrepancies in mortality rates may be related to the advancements in antibiotic therapy and the widely accepted early initiation of broad-spectrum antimicrobials. However, additional studies are needed to fully evaluate morality rates and outcomes of patients with nonstaphylococcal CIED-related endocarditis, particularly Gram-negative, anaerobic rods.

Despite the recent increase in polymicrobial bacteremia and infective endocarditis, CIED related endocarditis secondary to nonstaphylococcal species, including Gram negative, anaerobic rods, is quite rare [7]. These organisms are inherently less likely to hematogenously seed or adhere to endothelialized cardiac devices when compared to Gram positive organisms [4]. Multiple risk factors and comorbid conditions, in addition to injection drug use, have been identified as risk factors for nonstaphylococcal CIED-related endocarditis such as hypertension, congestive heart failure, coronary artery disease, diabetes mellitus and liver disease [7,12]. Our patient's history of diabetes mellitus certainly increased her risk for nonstaphylococcal CIED-related endocarditis. Given that our patient had growth of *Streptococcus agalactiae* on initial blood cultures this case can be considered a polymicrobial infection. However, while *Streptococcus agalactiae* is considered a co-pathogen with *P. bivia* and possibly the cause of the patient's native tricuspid valve endocarditis, it was not isolated on the patients CIED cultures. Like *P. bivia*, *Streptococcus agalactiae* is a rare cause of endocarditis [13]. While our patient did not use injection drugs, her history of diabetes also placed her at risked for a polymicrobial infection.

P. bivia, a member of the Prevotellaceae family, is characterized as a Gram-negative, obligatory anaerobic bacillus that is primarily found in the female urogenital tract as well as the respiratory and digestive tracts [14,15]. *P. bivia* is a common cause of urogenital infections such as bacterial vaginosis [14,15]. Less commonly, *P. bivia* has been found to cause other infections such as osteomyelitis, septic arthritis, and abscesses [16,17]. *P. bivia* has also been identified as a rare cause of infective endocarditis [17]. According to Brook, patients with head and neck infections, pulmonary infections, diabetes, and a history of drug use are at risk for *Prevotella* endocarditis. [7] We suspect our patient's bacteremia may have been secondary to her recent upper respiratory tract infection or poor dentition with multiple dental caries. There are very few published case reports of endocarditis secondary to *P. bivia*. In 1994, Kentos et al. reported a case of *P. bivia* endocarditis in a 60-year-old man who presented with peripheral emboli, multiple abscesses, and tricuspid valve vegetations [17]. To our knowledge there are no prior published case reports of *P. bivia* CIED related endocarditis. Our case highlights how *P. bivia* has the potential to cause both native valve endocarditis, as previously reported in the literature, and hematogenously seed cardiac devices.

More recently, the management and treatment of Gram-negative, anaerobic rod endocarditis has become more complex due to an increasing resistance against several antimicrobials including beta-lactams and metronidazole [7]. This growing resistance has led to an increase in the use of carbapenems in the treatment of Gram-negative, anaerobic rod endocarditis [18]. Recent reports have described alarming carbapenem resistance in some *Prevotella* species [18]. Fortunately, our patient responded well to carbapenem therapy and recovered from her *P. bivia* CIED related endocarditis. Our case demonstrates that although rare, *P. bivia* is a serious and evolving cause of Gram-negative, anaerobic rod CIED related endocarditis.

CRediT authorship contribution statement

All authors reviewed the literature and helped write the manuscript. Benjamin Fogelson, DO, James Livesay, DO, Michael Rohrer, DO, Megan Edwards, MD, and Jeffrey B. Hirsh, MD performed critical revisions of the article and approved the final version of manuscript.

Data availability

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

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None to declare.

Informed consent

Taken.

Conflict of interest

The Authors declare that there are no conflicts of interest.

References

[1] Greenspon AJ, Patel JD, Lau E, Ochoa JA, Frisch DR, Ho RT, et al. 16-year trends in the infection burden for pacemakers and implantable cardioverter-defibrillators in the United States 1993 to 2008. J Am Coll Cardiol 2011;58(10):1001–6.
[2] Tarakji KG, Ellis CR, Defaye P, Kennergren C. Cardiac implantable electronic device infection in patients at risk. Arrhythm Electro Rev 2016;5(1):65–71.
[3] Voigt A, Shalaby A, Saba S. Continued rise in rates of cardiovascular implantable electronic device infections in the United States: temporal trends and causative insights. Pacing Clin Electro 2010;33(4):414–9.
[4] Baddour LM, Epstein AE, Erickson CC, Knight BP, Levison ME, Lockhart PB, et al. Update on cardiovascular implantable electronic device infections and their management. Circulation 2010;121(3):458–77.
[5] Cabell CH, Heidenreich PA, Chu VH, Moore CM, Stryjewski ME, Corey GR, Fowler VG Jr. Increasing rates of cardiac device infections among Medicare beneficiaries: 1990-1999. Am Heart J 2004;147(4):582–6.
[6] Wang A, Gaca JG, Chu VH. Management considerations in infective endocarditis: a review. Jama 2018;320(1):72–83.
[7] Brook I. Infective endocarditis caused by anaerobic bacteria. Arch Cardiovasc Dis 2008;101(10):665–76. PMID: 19056073.
[8] Lassmann B, Gustafson DR, Wood CM, Rosenblatt JE. Reemergence of anaerobic bacteremia. Clin Infect Dis 2007;44(7):895–900.
[9] Kestler M, Muñoz P, Marín M, Goenaga MA, Idígoras Viedma P, de Alarcón A, et al. Endocarditis caused by anaerobic bacteria. Anaerobe 2017;47:33–8.
[10] Finegold SM. Anaerobic infections in humans: an overview. Anaerobe 1995;1(1):3–9.
[11] Nastro LJ, Finegold SM. Endocarditis due to anaerobic gram-negative bacilli. Am J Med 1973;54(4):482–96.
[12] Viola GM, Awan LL, Darouiche RO. Nonstaphylococcal infections of cardiac implantable electronic devices. Circulation 2010;121(19):2085–91.
[13] Teran CG, Antezana AO, Salvani J, Abaitey D. Group B streptococcus endocarditis associated with multiple pulmonary septic emboli. Clin Pract 2011;1(1):7. e7-e7.
[14] Marrazzo JM, Hillier SL. Chapter 18 - bacterial vaginosis. In: Stanberry LR, Rosenthal SL, editors. Sexually Transmitted Diseases. Second editionAcademic Press; 2013. p. 463–98.
[15] Gupta VK, Chaudhari NM, Iskepalli S, Dutta C. Divergences in gene repertoire among the reference Prevotella genomes derived from distinct body sites of human. BMC Genom 2015;16(1):153. PMCID: PMC4359502.
[16] Laiho K, Kotilainen P. Septic arthritis due to Prevotella bivia after intra-articular hip joint injection. Jt Bone Spine 2001;68(5):443–4. PMID: 11707013.
[17] Kentos A, Motte S, Nonhoff C, Jacobs F, De Smet JM, Serruys E, Thys JP. Prevotella bivia as an unusual cause of endocarditis. Eur J Clin Microbiol Infect Dis 1994;13(2):142–5. PMID: 8013486.
[18] Garrett WS, Onderdonk AB. 249 - bacteroides, prevotella, porphyromonas, and fusobacterium species (and other medically important anaerobic gram-negative bacilli). In: Bennett JE, Dolin R, Blaser MJ, editors. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. eighth editionPhiladelphia: W.B. Saunders; 2015. p. 2773–80.