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A Case of Serratia Marcescens Endocarditis in A Prosthetic Valve

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Abstract

Serratia marcescens is one of the rare pathogens known to cause infective endocarditis in IV drug users. In this report, we review a 29-year-old male patient's case of prosthetic valve endocarditis due to Serratia. The patient's disease course was complicated by developing significant septic emboli and need for mechanical intubation. Despite surgical valve replacement being the first line management option in those cases, our patient was not eligible for this intervention. Instead, the patient was successfully managed with cefepime and levofloxacin which resulted in clearance of blood cultures.

Introduction

The incidence of prosthetic valve infective endocarditis can range from 1% to 6% which accounts for 16% to 33% of all infective endocarditis cases [1-10]. The risk of developing prosthetic valve endocarditis is highest within the first twelve months of transcatheter valve replacement with the peak at two months [11-15]. Infective endocarditis due to Serratia marcescens is rare and has an incidence as low as 0.1% of endocarditis cases in the United States [16-17] Intravenous drug use is among the risk factors for Serratia endocarditis which also include health care exposure, invasive procedures, and implanted endovascular devices [18]. The treatment of this specific organism is focused on surgical management in combination with prolonged courses of antimicrobial therapy. Most antimicrobial regimens consist of a beta-lactam in combination with either an aminoglycoside or a fluoroquinolone due to the risk of ampC resistance encoded in this organism [19].

Case Presentation

A 29-year-old white male patient presented to the emergency department for evaluation of a four-day history of joint aches, vomiting yellow material and fever of 103° F. He had a past medical history of infective endocarditis due to Methicillin Resistant Staphylococcus Aureus (MRSA) managed surgically with tricuspid valve replacement approximately four months prior to this hospital visit. The patient also had an extensive history of IV heroin use. Upon initial examination, the patient had a negative chest X-ray, normal electrocardiogram, computed tomography scan of the abdomen and pelvis showing splenomegaly and a positive urinalysis. Two sets of blood cultures as well as a urine culture were collected from the patient for further evaluation. The patient was treated empirically with piperacillin-tazobactam 3.375 g IV and vancomycin 1000 mg IV single doses. The initial patient workup revealed acute renal failure with serum creatinine of 3.79 mg/dL, urinary tract infection with

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urinalysis positive for nitrites and leukocyte esterase, thrombocytopenia with platelet count of 22,000/µL, and elevated liver function tests with ALT 174 Units/L and AST 227 Units/L. As a result, the patient was admitted to the surgical intensive care unit for the management of sepsis and septic shock. During the patient's ICU stay, blood and urine cultures grew gram negative rods which were identified to be Serratia marcescens (Table 1). Due to the history of endocarditis and recent surgical intervention, a Transthoracic Echocardiogram (TTE) was obtained, which showed a vegetation in the bioprosthetic tricuspid valve with no valvular regurgitation or stenosis. Due to the patient's history of recurrent IV heroin use despite previous valve replacement; he did not qualify for another valve replacement procedure. Treatment with cefepime 2 g every 12 hours IV extended infusion over 4 hours was initiated. The following day, levofloxacin 740 mg IV every 48 hours was added due to concern for inducible ampC resistance associated with this organism.

The patient's course was complicated by severe opioid withdrawal requiring intubation for airway protection as well as development of extensive ischemia of the feet due to septic emboli. Sedation was maintained using propofol, fentanyl and dexmedetomidine after intubation. Vasopressor support with norepinephrine was required to maintain the patient's mean arterial pressure above the goal of 65 mmHg. On the fourth day of the ICU stay, the dose of levofloxacin was adjusted to 750 mg IV daily as serum creatinine improved to be 2.16 mg/dL. Thrombocytopenia started resolving on ICU day five, with platelet count increasing to 79,000/µL, allowing the addition of venous thromboembolism prophylaxis with heparin 5000 units subcutaneously every 8 hours. In an effort to limit the use of fentanyl infusion to resolve the ileus that the patient developed, his sedation was switched to ketamine infusion instead. On day nine in the ICU, blood cultures were repeated to assess the efficacy of the antimicrobial regimen in resolving the infection. The repeated TTE was negative for tricuspid valve vegetation and the blood cultures were negative.

After ten days of ICU care, the patient was transferred to a medical surgical unit for the management of the worsening ischemia of the feet (Figure 1). The patient had to undergo bilateral proximal Trans Metatarsal Amputation (TMA) of the feet prior to discharge. The infectious disease specialists also decided to de-escalate antimicrobial therapy from cefepime and levofloxacin, after completing a 14-day course, to ceftriaxone 2 g IV daily to continue the six-week total duration. The patient was discharged with the expectation to complete the course, and follow up with the infectious disease specialist and podiatrist.

Discussion

Prosthetic valve endocarditis incidence ranges from 1% to 6% and accounts for 16% to 33% of all infective endocarditis cases [20]. Multiple factors can place patients at risk for this form of endocarditis including male sex, previous native valve endocarditis, and long cardiopulmonary bypass time for prosthetic valve replacement [20]. Endocarditis is commonly caused by Methicillin-Susceptible Staphylococcus Aureus (MSSA) or MRSA. However, in patients who abuse IV drugs, especially in unsanitary conditions, infective endocarditis can be caused by more resistant organisms such as Serratia marcescens. Infective endocarditis is usually difficult to manage with antimicrobials alone, and surgical intervention is commonly needed to replace the infected valve to eradicate the vegetations.

Figure 1: Ischemia of Feet Prior to TMA.

Table 1: Ischemia of Feet Prior to TMA.

	Serratia marcescens	
Drug	**MIC Interpretation**	**MIC Dilution (µg/mL)**
Aztreonam	S	<1
Cefepime	S	<1
Ceftazidime	S	<1
Ceftriaxone	S	<1
Gentamicin	S	<1
Levofloxacin	S	<0.12
Meropenem	S	<0.25
Nitrofurantoin	R	256
Tobramycin	I	8

Serratia marcescens is a gram-negative facultative anaerobe which can lead to infective endocarditis affecting the tricuspid valve. It possesses encoded ampC genes which lead to inducible resistance. The main antibiotic inducers of ampC resistance are aminopenicillins, amoxicillin-clavulanate, and most cephalosporins. Available evidence recommends a combination antimicrobial therapy consisting of a beta-lactam (penicillins, cephalosporins, carbapenems) and either aminoglycoside or fluoroquinolone for a six-week treatment course [19].

Our patient had risk factors for developing this prosthetic valve endocarditis given that he is a male with active IV drug use and recent history of valve replacement for previous endocarditis. Unfortunately, in this patient's case, surgical intervention was not an option due to history of previous valve replacement procedure and his continued IV drug use. Based on the current recommendations and through researching similar patient cases, the team concluded that the patient should be treated with cefepime and levofloxacin. Cefepime was specifically chosen since it is one of the least likely cephalosporins to lead to ampC inducible resistance. This combination of antibiotics was successful in treating the patient's infection as proven by the negative repeat blood cultures as well as repeat TTE being negative for vegetation. After validation of clearing blood cultures,

the transition to ceftriaxone alone was appropriate to facilitate patient compliance in completing the six-week course of treatment after discharge.

Conflict of Interest: The authors have no conflicts of interest to disclose.

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