ScienceForecast
A digital science library

Case Report
Published: 22 Aug, 2018

Journal of Clinical Case Reports

Community-Acquired Carbapenem-Resistant *Serratia marcescens* Endocarditis: A Case Report

Shah MD[1], Reed EE[1] and Mangino JE[2]*

[1]Department of Pharmacy, The Ohio State University Wexner Medical Center, USA

[2]Department of Internal Medicine, Division of Infectious Diseases, The Ohio State University Wexner Medical Center, USA

Abstract

We describe a case of carbapenem-resistant *Serratia marcescens* endocarditis in an intravenous drug user. Septic emboli to the brain, large splenic abscesses, and an ankle abscess were identified on imaging. The patient completed therapy with ceftazidime/avibactam and ciprofloxacin, but was lost to follow-up for rehabilitation and subsequent cardiac surgery evaluation.

Keywords: Carbapenem-resistant Enterobacteriaceae; Serratia marcescens; Endocarditis

Introduction

Serratia marcescens is a member of the Enterobacteriaceae family and has been implicated in respiratory tract infections, urinary tract infections, skin and soft tissue infections, meningitis, and bacteremia. Although there are a limited number of reports, *S. marcescens* can also be associated with endocarditis, especially in the setting of intravenous drug use (IVDU) [1]. This organism can harbor many different mechanisms of resistance, including carbapenemases, posing a challenge for treatment [1]. This report describes a patient with carbapenem-resistant *S. marcescens* endocarditis with multiple metastatic sites of infection treated with ceftazidime/avibactam and ciprofloxacin.

Case Presentation

A 25-year-old male intravenous drug user (IVDU) presented with fevers to 38.6°C, malaise and body aches for three weeks, right ankle pain/swelling for three days, and left-sided abdominal pain prior to admission. He denied sharing needles, but admitted to re-use after cleaning them with tap water. Pertinent labs included white blood cell (WBC) count 34.58 K/μL, serum creatinine 1.11 mg/dL (estimated CrCl 125 ml/min), and C-reactive protein 118.4 mg/L. Vancomycin and piperacillin/tazobactam were started and Infectious Diseases (ID) was consulted to assist with management on hospital day (HD) 2. A transesophageal echocardiogram showed a 1.1 cm vegetation on the posterior leaflet of the mitral valve with mild to moderate mitral regurgitation (Figure 1). Abdominal computed tomography (CT) demonstrated renal (2.0 x 1.3 cm) and splenic (11.2 x 8 cm and 5.3 x 2.5 cm) infarcts and right ankle MRI showed a small abscess (5 x 9 x 13 mm) with mild tenosynovitis. On HD 4, blood cultures grew carbapenem-resistant *S. marcescens* (Table 1). He was placed in contact isolation and changed to ceftazidime/avibactam 2.5 g IV every 8 hours, tigecycline 100 mg IV every 12 hours, and ciprofloxacin 400 mg IV every 8 hours to ensure at least two active agents while awaiting the ceftazidime/avibactam susceptibility as a send-out test at our hospital. Cardiac Surgery was consulted for a valve replacement; however, surgery was deferred as brain MRI demonstrated multiple embolic infarcts (Figure 1). Blood cultures cleared on HD 5, and ceftazidime/avibactam returned as susceptible (MIC 2/4) on HD 11. Ceftazidime/avibactam and ciprofloxacin 500 mg PO every 12 hours were continued. Despite treatment, WBC remained elevated at 22 K/μL on HD 19 with worsening left upper quadrant abdominal pain. Repeat abdominal CT revealed massively increased splenic hypodensities (16.6 x 8.9 cm and 5.1 x 4.6 cm) consistent with abscesses (Figure 1) and metronidazole was added empirically. Splenectomy was deferred, and the larger abscess was percutaneously drained of 950 mL of purulent, culture-negative fluid on HD 21. He clinically improved with normalized WBC over the next week and was discharged to a long-term acute care hospital (LTACH) with plans for drug rehabilitation. He left the LTACH against medical advice after eight weeks of ceftazidime/avibactam, ciprofloxacin, and metronidazole, and was lost to outpatient ID follow-up.

He was readmitted one month later with methicillin-susceptible Staphylococcus aureus (MSSA)

OPEN ACCESS

Correspondence:
Mangino JE, Division of Infectious Diseases, Department of Internal Medicine, The Ohio State University Wexner Medical Center, 419 McCampbell Hall, 1581 Dodd Drive, Columbus, Ohio, USA.
Tel: *614-366-5405*
Fax: *614-293-8102*
E-mail: *Julie.Mangino@osumc.edu*

Received Date: *05 Jul 2018*
Accepted Date: *13 Aug 2018*
Published Date: *22 Aug 2018*

Citation: *Shah MD, Reed EE, Mangino JE. Community-Acquired Carbapenem-Resistant Serratia marcescens Endocarditis: A Case Report. J Clin Case Rep. 2018; 1(2): 1011.*

ISSN 2643-8194

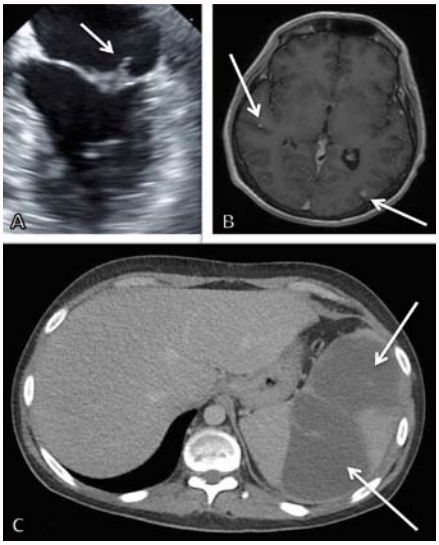

Figure 1: Images obtained on the patient with arrows at areas of interest. (A) Transesophageal echocardiogram revealed 1.1 cm vegetation on the mitral valve. (B) Brain MRI showed multiple small foci of enhancement. (C) Repeat abdominal CT on hospital day 19 demonstrated multiple expanding splenic abscesses.

bacteremia, a persistent posterior leaflet mitral valve vegetation (1 cm), and new anterior leaflet mitral valve vegetation (0.85 cm) with a torn leaflet and severe mitral regurgitation. Abdominal CT demonstrated improved splenic lesions [8.4 x 4.2 cm (previously 12.8 x 4.5 cm) and 5.5 x 2.1 cm (previously 9.4 x 2.7 cm)]. The plan had been to continue the initial regimen until there were stable residual scars.

Additionally, a repeat brain MRI demonstrated worsening septic emboli with early abscess. The ID consultants resumed ceftazidime/avibactam, ciprofloxacin, and metronidazole for carbapenem-resistant *S. marcescens* and continuous infusion nafcillin for MSSA, given the persistent/new vegetations, septic brain emboli, and splenic abscesses. He completed six weeks of therapy at an LTACH with drug rehabilitation plans once discharged home. However, he was lost to follow-up with ID and cardiac surgery for valve replacement.

Discussion

The Centers for Disease Control and Prevention considers carbapenem-resistant Enterobacteriaceae (CRE) an urgent public health threat due to increasing prevalence and resistance to multiple antibiotics [2]. Patients with CRE infections have significantly higher mortality rates compared to those with carbapenem-susceptible bacterial infections, and nearly 50% of patients who acquire a CRE bloodstream infection die from their infection [2-5]. Poor outcomes are due to the severity of underlying illness or inappropriate initial antimicrobials [5]. In our case, this patient initially improved despite a large vegetation on the mitral valve and multiple metastatic sites of infection to brain, kidney, spleen, and ankle, but was not cured.

S. marcescens is an aerobic, motile, gram-negative bacillus that is ubiquitous in the environment, including water, soil, plants, animals, and food [1]. It was not until the 1950's that *S. marcescens* was considered to be pathogenic and now has been implicated in a variety of infections, including endocarditis [1]. As *Serratia* endocarditis is associated with IVDU, we suspect our patient acquired this from IVDU and needle reuse after cleaning with tap water, as seen with previous reports of *Serratia* infections from this source [1,6].

Table 1: *Serratia marcescens* susceptibility.

	MIC	Interpretation
Amikacin	≤16	S
Ceftazidime/avibactam	2/4	S
Ciprofloxacin	≤1	S
Ertapenem	>4	R
Gentamicin	≤4	S
Levofloxacin	≤2	S
Meropenem	>8	R
Piperacillin/tazobactam	64/4	I
Tigecycline	≤1	S
Tobramycin	≤4	S
Trimethoprim/sulfamethoxazole	≤2/38	S

MIC: Minimum Inhibitory Concentration; S: Susceptible; I: Intermediate; R: Resistant.

Mechanisms of resistance for *S. marcescens* involve efflux pumps, modifications in target proteins, and expression of β-lactamases such as AmpC β-lactamases, extended-spectrum β-lactamases, and carbapenemases [1]. Infections caused by CRE are concerning given limited therapeutic options. Although polymyxin is reserved for CRE infections, *Serratia* is intrinsically resistant [7]. While tigecycline has activity against CRE, it may not be optimal for bloodstream infections due to low serum concentrations [7]. Fluoroquinolones and trimethoprim/sulfamethoxazole may demonstrate *in vitro* activity against CRE, but there is insufficient literature on these antibiotics for CRE treatment. Ceftazidime/avibactam is a third-generation cephalosporin combined with a novel non-β-lactam β-lactamase inhibitor that demonstrates *in vitro* activity against CRE with an improved spectrum against Class A and C β-lactamases and Class D OXA-48 carbapenemases, but has no effect on Class B metallo-β-lactamases and other Class D β-lactamases [8].

The American Heart Association guidelines for infective endocarditis recommend combination therapy with a β-lactam and an aminoglycoside or fluoroquinolone, with cardiac surgery, for treatment of non-HACEK gram-negative bacilli endocarditis [9]. Combination therapy for CRE endocarditis is challenging due to limited susceptible agents, but has been associated with decreased mortality for severe CRE infections, such as bacteremia or respiratory tract infections, versus monotherapy [7]. Although our patient was on pathogen-directed combination therapy with ceftazidime/avibactam, tigecycline, and ciprofloxacin within 72 hours of the index culture, he progressed likely due to microbe burden and evolution of large splenic abscesses. He had presumptive improvement after eight weeks of ceftazidime/avibactam and ciprofloxacin, although brain lesions were not re-imaged prior to MSSA bacteremia to confirm resolution.

Although there have been reports of carbapenem-resistant Serratia infections and CRE endocarditis in the United States [10-12], this is the first reported case, to our knowledge, of carbapenem-resistant *S. marcescens* endocarditis. This case illustrates a serious infection due to a community-associated multi-drug resistant organism and the complexity of treating CRE in IVDU as the overlapping of two epidemics.

References

1. Phadke VK, Jacob JT. Marvelous but Morbid: Infective Endocarditis due

to Serratia marcescens. Infect Dis Clin Pract. 2016; 24: 143-150.

2. Centers for Disease Control and Prevention. Antibiotic resistance threats in the United States. 2013.

3. Gasink LB, Edelstein PH, Lautenbach E, Synnestvedt M, Fishman NO. Risk Factors and Clinical Impact of Klebsiella pneumoniae Carbapenemase-Producing K. pneumoniae. Infect Control Hosp Epidemiol. 2009; 30: 1180-1185.

4. Patel G, Huprikar S, Factor SH, Jenkins SG, Calfee DP. Outcomes of Carbapenem-Resistant Klebsiella pneumoniae Infection and the Impact of Antimicrobial and Adjunctive Therapies. Infect Control Hosp Epidemiol. 2008; 29: 1099-1106.

5. Kohler PP, Volling C, Green K, Uleryk EM, Shah PS, McGeer A. Carbapenem Resistance, Initial Antibiotic Therapy, and Mortality in Klebsiella pneumoniae Bacteremia: A Systematic Review and Meta-Analysis. Infect Control Hosp Epidemiol, 2017; 38: 1319-1328.

6. Horcajada JP, Martinez JA, Alcón A, et al. Acquisition of Multidrug-Resistant Serratia marcescens by Critically Ill Patients Who Consumed Tap Water During Receipt of Oral Medications. Infect Control Hosp Epidemiol. 2006; 27: 774-777.

7. Morrill HJ, Pogue JM, Kaye KS, LaPlante KL. Treatment Options for Carbapenem-Resistant Enterobacteriaceae Infections. Open Forum Infect Dis. 2015; 2: ofv050.

8. Zasowski EJ, Rybak JM, Rybak MJ. The β-lactams Strike Back: Ceftazidime-Avibactam. Pharmacotherapy. 2015; 35: 755-770.

9. Baddour LM, Wilson WR, Bayer AS, et al. Infective Endocarditis in Adults: Diagnosis, Antimicrobial Therapy, and Management of Complications: A Scientific Statement for Healthcare Professionals From the American Heart Association. Circulation. 2015; 132: 1435-1486.

10. Lodise T, Ye MJ, Zhao Q. Prevalence of Invasive Infections Due to Carbapenem-Resistant Enterobacteriaceae among Adult Patients in U.S. Hospitals. Antimicrob Agents Chemother. 2017; 61: e00228-317.

11. Raymond T, Wiesen J, Rehm S, Auron M. Carbapenem-Resistant Klebsiella pneumoniae Prosthetic Valve Endocarditis: A Feared Combination of Technology and Emerging Pathogens. Infect Dis Clin Pract. 2014; 22: 113-115.

12. Wu G, Abraham T, Lee S. Ceftazidime-Avibactam for Treatment of Carbapenem-Resistant Enterobacteriaceae Bacteremia. Clin Infect Dis. 2016; 63: 1147-1148.