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Case report

Rare case of *Rhizobium radiobacter* bioprosthetic mitral valve endocarditis

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ABSTRACT

Rhizobium radiobacter is an aerobic, gram negative, rod-shaped, bacterium typically found in the soil. Commonly a plant pathogen, it is also a rare human pathogen causing serious disease. Risk factors for infection include neutropenia, leukopenia, catheters, hospitalization, and low CD4+ lymphocyte count, especially in patients with malignancy or human immunodeficiency virus. There is currently limited literature to establish a definitive guideline for antimicrobial therapy and obtaining susceptibilities from a specialized laboratory is appropriate. We present a successfully treated case of *R. radiobacter* bioprosthetic mitral valve endocarditis in a patient with previous *S. epidermidis* endocarditis.

Introduction

Rhizobium radiobacter is an aerobic, gram-negative, rod-shaped bacterium that lives in the soil. It is a rare cause of human infection, most commonly occurring in immunocompromised patients [1]. The first reported case of human pathology was one of prosthetic aortic valve endocarditis in 1980 [3]. Reports of septicemia, peritonitis, endocarditis, abscess, meningitis and catheter-related blood stream infections have since been reported. The majority of patients with *R. radiobacter* have indwelling catheters in the setting of significant medical comorbidities. We present a rare case of *R. radiobacter* bioprosthetic mitral valve endocarditis in a patient with previous *Staphylococcus epidermidis* endocarditis.

Case report

A 47 year old male with history of *Staphylococcus epidermidis* native mitral valve endocarditis with bioprosthetic replacement two years ago, coronary artery disease, chronic obstructive pulmonary disease and type 2 diabetes mellitus presented with tachycardia and an irregularly irregular rhythm. The patient endorsed mild diaphoresis, palpitations, occasional night sweats, and mild dyspnea. He denied fever and chills. He was afebrile on presentation with a white blood cell count of 11.3×10^9/L, hemoglobin of 8.6 g/dL, and troponin T of 0.04 ng/mL. Laboratory workup also revealed acute on chronic kidney disease, which progressed to dialysis dependent renal failure. Initial electrocardiogram showed atrial flutter with rapid ventricular response. After a diltiazem infusion failed to achieve adequate rate control, he underwent transesophageal echocardiogram in preparation for electrical cardioversion. Two small mobile masses were visualized, one on each mitral leaflet. One was fixed to the ventricular aspect measuring 0.7 cm in cross section, while the other was on the atrial surface, measuring 2.07 × 0.36 cm (Fig. 1).

As there was uncertainty whether these masses were thrombus or vegetation, blood cultures were obtained. Gram negative rods were found and were subsequently identified by mass spectroscopy microbial identification system as *R. radiobacter*. The patient was started on ceftriaxone. Daily blood cultures persistently showed the organism four days into ceftriaxone therapy and the patient was switched to ertapenem and levofloxacin. The patient subsequently developed severe thrombocytopenia and ertapenem was discontinued after five days of therapy while levofloxacin was continued. Susceptibility results were not available from our laboratory and were requested from a specialty laboratory. The following susceptibilities results are shown in Table 1.

Sensitivities showed susceptibility to ceftazidime, and he was switched to ceftazidime after thirteen days of levofloxacin therapy. Throughout his hospitalization, the patient denied feeling chest pain, shortness of breath above baseline, fever, chills, and night sweats. Blood cultures remained negative since initiation of levofloxacin. The patient remained on ceftazidime for an additional nine days before being switched to piperacillin-tazobactam. Twelve days later, the patient was discharged on home cefepime and completed an eight week course. Of note, repeat transesophageal echocardiogram was performed 35 days after the initial echocardiogram and showed a reduced size of the previously identified vegetations on his bioprosthetic mitral valve (Fig. 2).

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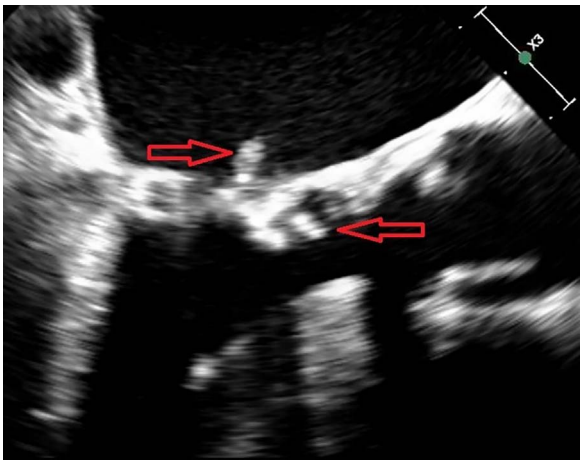

Fig. 1. Transesophageal echocardiogram (TEE) showing two small mobile masses. One appears on the ventricular aspect and the other on the atrial aspect of bioprosthetic mitral valve.

Table 1
This table demonstrates susceptibilities as reported by specialty laboratory which further guided antibiotic management.

Antimicrobial	MIC (mcg/ml)	Susceptible/ Resistant
Piperacillin/tazobactam	≤16/4	S
Cefepime	≤2	S
Ceftazidime	8	S
Meropenem	2	S
Aztreonam	> 16	R
Ciprofloxacin	≤1	S
Levofloxacin	≤1	S
Amikacin	32	I
Gentamicin	8	I
Tobramycin	> 8	R
Trimethoprim/Sulfamethoxazole	> 2/38	R

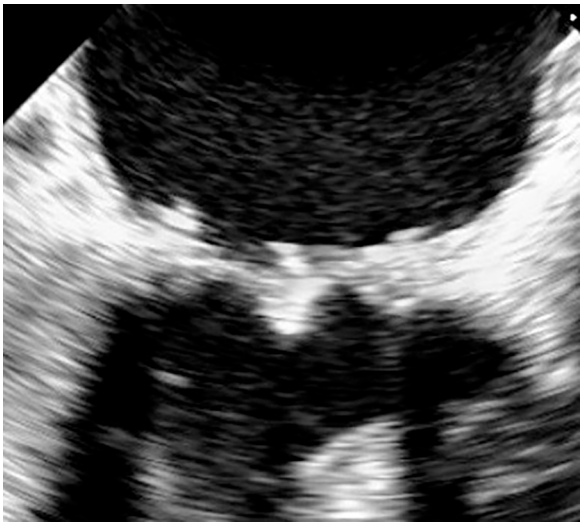

Fig. 2. Repeat TEE showing almost entire resolution of previously identified vegetations, with only small residual mass on atrial aspect of bioprosthetic valve.

Unfortunately, his renal failure never improved and he remains hemodialysis dependent. His mitral valve stenosis is severe and quality of life is negatively impacted secondary to functional limitations. His long-term prognosis is guarded despite successful treatment for *Rhizobium radiobacter* endocarditis.

Discussion

Rhizobium radiobacter is a gram-negative, non-spore forming bacteria which used to be classified under the genus of *Agrobacterium* as recently as 2003 [4]. It is a soil organism which has been implicated in tumor pathogenesis in multiple plant species important for agriculture.

More recently, *R. radiobacter* has been recognized as a pathogen known to cause serious infections in immunocompromised and debilitated individuals [7]. Since the 1980s, there have been increasing case reports of this organism causing bacteremia in patients with intravenous catheters, primarily in patients with underlying immunosuppression secondary to malignancies and HIV [5]. Most cases reported in the literature suggest that the major risk factors shared between patients infected with *R. radiobacter* are neutropenia, leukopenia, catheters, hospitalization, and low CD4+ lymphocyte count [2]. Prosthetic valve endocarditis is a rare manifestation of *R. radiobacter* infection that has only been reported a limited number of times.

This case is a rare example of bioprosthetic mitral valve endocarditis in an individual who lacked significant risk factors to suggest that he was immunocompromised. The patient did have a formal diagnosis of COPD and type 2 diabetes mellitus but had not received any systemic steroids in the previous year and his most recent glycosylated hemoglobin level was less than 6%. In previous reported cases of *R. radiobacter* endocarditis, an important similarity shared between the patients was a predisposition to infections as suggested by their debilitated clinical picture. For example, in one case report a patient with a known history of active hepatitis C infection who had just underwent a femoral popliteal thromboembolectomy developed *R. radiobacter* endocarditis of a prosthetic valve [8]. A second case report in Venezuela reported a patient with chronic kidney disease stage 5 on hemodialysis develop a tricuspid fusiform vegetation with *R. radiobacter* [6]. The clinical presentation of our patient raises the possibility that *Rhizobium* endocarditis and bacteremia can manifest in immunocompetent individuals, especially in the presence of prosthetic cardiac valves.

Another important discussion point with *R. radiobacter* endocarditis is establishing an antimicrobial guideline to treat this infection. Our patient was successfully treated with a prolonged course of levofloxacin, piperacillin/tazobactam, and cefepime with the assistance of a specialized laboratory for sensitivity testing. There is currently limited literature to establish a definitive guideline for the correct use of antimicrobials in the treatment of *R. radiobacter* infections. However, in one case series in Taiwan, isolates of the *R. radiobacter* organism were obtained from thirteen patients infected between 1996 and 2002 [1]. These isolates showed susceptibility to cefepime, piperacillin-tazobactam, carbapenems, and ciprofloxacin. These isolates were obtained from a number of infected sites but did not include any cases of confirmed endocarditis [1]. Nonetheless, our patient was successfully treated with the same antimicrobials as reported in the study. As described earlier, the patient with *R. radiobacter* endocarditis of a prosthetic mitral valve after undergoing a femoral-popliteal thromboembolectomy was successfully treated with a six-week course of piperacillin/tazobactam$_8$, and a patient in Venezuela with a tricuspid fusiform vegetation was successfully treated with a six-week course of imipenem [6,8]. However, some resistance to ampicillin-sulbactam, ceftazidime, cefotaxime, and aztreonam was documented in a Taiwanese study [1]. Due to limited literature data on the success and failure of antimicrobial therapy in the treatment of *R. radiobacter* and the rarity of the organism, it is still reasonable to obtain sensitivities from a specialized laboratory on a case-by-case basis.

Conclusion

Rhizobium radiobacter is a gram negative, non-spore forming bacillus belonging to the genus *Argobacterium* [3]. It has been previously isolated from leg abscesses, wounds, blood, bronchial washings, tracheal aspirates, synovial fluid, and intravenous catheters [3]. Reports on *R.*

radiobacter causing endocarditis and bacteremia have been limited to a few case reports, manifesting in immunocompromised individuals [3]. Our case demonstrates an immunocompetent host for *R. radiobacter* bacteremia and bioprosthetic endocarditis. The small study conducted in Taiwan where eighteen isolates of *R. radiobacter* in-vitro susceptibilities were established is the largest study of antibiotic efficacy in treating *R. radiobacter*. More studies of in-vitro susceptibilities are required to establish a more definitive antimicrobial approach for this organism. For cases of endocarditis, such as this one, cefepime, piperacillin-tazobactam, carbapenems, and fluoroquinolones are reasonable empiric antimicrobial agents, but it may be wise to obtain sensitivities from a specialty laboratory.

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