Rhodococcus empyema in a heart transplant patient

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Keywords
Empyema, heart transplant, pneumonia, Rhodococcus equi.

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Received 14 November 2013; Revised 03 December 2013; Accepted 12 December 2013

Respirology Case Reports 2014; 2(1): 42–44
doi: 10.1002/rcr2.43

Abstract
Rhodococcus equi is a rare cause of pneumonia and empyema almost exclusively occurring in immunocompromised patients. Most people who become infected have direct exposure to livestock. We present a case where the exposure was presumed to be through a family member in close contact with horses. Our case describes an infection in a heart transplant patient that was initially identified as a probable intra-abdominal infection and later reidentified as Rhodococcus equi empyema, and was treated with surgery and prolonged antibiotics.

Introduction
Rhodococcus equi is a gram-positive coccobacillus reported to cause both veterinary infections and also infections in immunocompromised patients [1, 2]. The majority of cases in transplant patients have lung involvement [3]. Most cases of lung infection have shown abscess formation with necrotizing pneumonia [4, 5].

Case Report
A 62-year-old man with ischemic cardiomyopathy presented with worsening dyspnea and was found to have a decrease in left ventricular ejection fraction from 28% to 13%. After consultation with the cardiac transplant service, we decided to place a left ventricular assist device (LVAD) and an implantable cardiac defibrillator. Both devices were intended as temporizing measures and were placed without complication.

In July of 2011, the patient underwent an orthotopic heart transplant. After an uneventful 11-day recovery, the patient was discharged home. His discharge medications included fluconazole, mycophenolate mofetil, prednisone, trimethoprim/sulfamethoxazole, tacrolimus, and valganciclovir.

Five months after the transplant, the patient presented to the emergency room with fever, vomiting, and diarrhea. Immediately prior to his admission, the patient had a normal cardiac biopsy. His physical examination revealed a fatigued appearing male in no acute distress. The patient’s temperature was 96.5°F (35.8°C), blood pressure was 158/89 mmHg, heart rate was 100 beats/min, respiratory rate was 20 breath/min, and pulse oximetry was 95% on ambient air. His physical examination was remarkable only for sinus tachycardia. Relevant laboratory data included sodium of 119 mmol/L, potassium of 6.5 mmol/L, and creatinine of 2.7 mg/dL (238 mmol/L). The white blood cell count was 5.56 K/μL with a normal differential. The chest X-ray revealed patchy opacification in the posterior left upper lobe and the lingula, and a small left pleural effusion. A computed tomography (CT) scan of the abdomen revealed splenomegaly. A CT chest revealed possible loculated effusion in the anterior segment of the left upper lobe and adenopathy in the mediastinum and hilum (Fig. 1).

Initial blood cultures revealed gram-negative rods (GNRs) and the patient was treated for a presumed intra-abdominal source of infection. Two days later, another culture bottle was reported as gram-positive rods (GPRs). On the basis of the GPRs present in the blood without
Rhodococcus infection was suspected. On further review, the initial culture that identified as GNR was actually a GPR. The differential diagnosis of a GPR included Rhodococcus, Bacillus sp., Nocardia, Listeria, and Actinomyces sp. The final microbiologic diagnosis was Rhodococcus equi. After obtaining further social history, it was found that the patient’s son worked at a rodeo, was rounding up wild horses, and frequently rode horses.

The antibiotics were changed to vancomycin, imipenem, and rifampin after consultation with the infectious disease service. Blood cultures remained positive. Fifteen days after admission, a percutaneous drain was placed in the left upper lobe abscess by interventional radiology. This fluid eventually grew out Rhodococcus equi. A month after admission, blood cultures continued to be positive and we decided to pursue surgical drainage. The patient underwent drainage of abscess and empyema of the left upper hemithorax with decortication. The LVAD remnant that is routinely left after LVAD explant was found to be walled off from the infection and was believed to be sterile. Furthermore, removal of the LVAD remnant would have required rebuilding part of the aorta and possibly compromising vertebral arteries. Postoperatively, the patient recovered with no further evidence of bacteremia. He was eventually discharged almost 2 months after admission on azithromycin, rifampin, and imipenem. He received 7 total weeks of imipenem treatment. He then continued azithromycin therapy for 6 total months with resolution of the infection and is now greater than 1 year after discontinuation of antibiotics without clinical relapse of infection.

Discussion
Rhodococcus equi is an unusual pathogen that was first recognized in veterinary medicine. The presentation in horses is generally pneumonia. The first case in humans was reported in 1967 in a 29-year-old man receiving prednisone and mercaptopurine. This patient was felt to have acquired infection while cleaning out animal pens. The initial patient was treated with erythromycin with a good response.

Rhodococcus is found in the soil, and inhalation is felt to be the primary mode of transmission. In most patients, the clinical presentation is upper lobe cavitary disease and bacteremia is common. Other more rare presentations have included osteomyelitis, pericarditis, central nervous system infection, and soft tissue abscess. In many cases, the source of exposure cannot be identified. The unique part of this case was the patient’s son had known exposure to horses. Given the primary mode of transmission is inhalation, we hypothesize that the son had contaminated soil on his clothing or in his vehicle and the patient was subsequently exposed to bacteria.

Treatment is driven by case studies and expert opinion. Susceptibility may vary, but in general, macrolides, rifampin, vancomycin, and imipenem have been effective. Fluoroquinolones and linezolid may also be effective. Resistance to penicillin and cephalosporins has been reported. Duration of therapy is ill-defined, but intravenous antibiotics are typically administered for a 6-week course, followed by oral antibiotics for an additional 6 months. The regimen of oral antibiotics has varied greatly. Surgery may be indicated in difficult-to-treat cases or failure to clear the pathogen.

Our patient’s exposure likely occurred through his son, and to our knowledge, this has not been a described method of transmission. This highlights the importance of counseling transplant patients and their immediate family about possible exposure to animals. Our case also highlights the possible misidentification of the bacteria. Given its gram variable, pleomorphic qualities, Rhodococcus equi can be mistaken for a gram-negative rod initially, which can delay proper treatment.

Disclosure Statements
No conflict of interest declared.

Appropriate written informed consent was obtained for publication of this case report and accompanying images.

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