CASE REPORT

Rhodococcus equi pneumonia and sepsis in an allogeneic haematopoietic stem cell transplant recipient

Lokesh Shahani

Department of Internal Medicine, Baylor College of Medicine, Houston, Texas, USA

Correspondence to
Dr Lokesh Shahani,
lokesh83@hotmail.com

Accepted 30 May 2014

SUMMARY

Rhodococcus equi is an aerobic facultative intracellular organism that is known to infect cells of the macrophage–monocyte lineage. It is a common veterinary pathogen; however, the incidence of this infection in humans has risen and it has been recognised as an emerging opportunistic pathogen among the immunocompromised patients. We present the case of a patient with chronic myeloid leukaemia who had received allogeneic stem cell transplant and presented to the hospital with clinical picture of pneumonia. Her condition worsened on initial broad spectrum antimicrobials and 3 weeks into her hospitalisation, *R. equi* was isolated from her bronchoalveolar lavage and blood cultures. Based on the susceptibility, therapy was changed to four active antimicrobials; however, the patient failed to improve and eventually died. This case highlights the importance of considering the diagnosis of *R. equi* among immunosuppressed patients early in the right clinical setting due to the high virulence associated with this organism.

BACKGROUND

Rhodococcus equi is an aerobic facultative intracellular organism that is known to infect cells of the macrophage–monocyte lineage. It is a common veterinary pathogen, initially isolated from lungs of young horses with pyogranulomatous pneumonia in 1923.¹ Since the first case of *R. equi* infection in human beings was described in 1967,² the incidence of this infection has risen and it has been recognised as an opportunistic pathogen among immunocompromised patients.³ Our literature search yielded only three prior to the reported cases of *R. equi* lung infection among haematopoietic stem cell transplant recipients.^{4–6} This would be the fourth reported case of *R. equi* lung infection in a haematopoietic stem cell transplant recipient.

CASE PRESENTATION

We present the case of a 53-year-old Caucasian woman with chronic myeloid leukaemia (CML) who received an allogeneic stem cell transplant with antithymocyte globulin, fludarabine and busulfan used as conditioning agents. She presented to the hospital 3 months later with dyspnoea and chest tightness. She described her symptoms as starting 4 days prior to her presentation with dyspnoea on minimal exertion, dry cough and chest tightness on

exertion. She also had a low grade fever at home on the day of presentation. She was a resident of rural Texas and stayed on a farm with exposure to farm animals including horses, although none of the animals were reported sick by the patient.

The patient's post-transplant course had been complicated by graft-versus-host disease of the gastrointestinal tract and skin for which she was on tacrolimus and prednisone for the past month. She also had a prior episode of cytomegalovirus (CMV) reactivation which was treated with foscarnet. Her other medications included voriconazole, valgancyclovir and trimethoprim/sulfamethoxazole.

On presentation the patient was febrile and in mild respiratory distress. She has evidence of minimal left basilar rales on examination. Her initial laboratory tests were significant for pancytopenia with a white cell count of 1700 cells/mm³ and absolute neutrophil count of 500 cells/mm³.

INVESTIGATIONS

The patient's initial CT scan of the chest showed evidence of left basilar infiltrates consistent with a diagnosis of pneumonia (figure 1). Her initial microbiological workup including blood and respiratory cultures did not result in a successful identification of an organism. She was empirically treated with a 10-day course of vancomycin and piperacillin/tazobactam with some improvement. However, a few days after discontinuing her antibiotics, her respiratory symptoms started worsening. She rapidly developed respiratory distress requiring intubation and was in shock requiring vasopressor support. At this time she had repeat CT scan of her chest which showed progressive disease with multiple patchy areas of consolidation throughout both lungs (figure 2).

Figure 1 CT scan of chest on presentation showing left basilar infiltrates.

To cite: Shahani L. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2014-204721

Figure 2 CT scan of chest 2 weeks later showing progressive disease with multiple patchy areas of consolidation throughout the lungs.

DIFFERENTIAL DIAGNOSIS

A long differential of organisms causing this multifocal pattern of pneumonia in this immunocompromised host was considered and appropriate diagnostic tests were ordered. Several immunocompromised patients are at risk for infection with traditional nosocomial bacteria such as *Pseudomonas aeruginosa*, *Klebsiella* sp, *Escherichia coli*, *Acinetobacter* sp and *Staphylococcus aureus*. Frequent fungal pulmonary infections among these patients include histoplasmosis, cryptococcosis, pneumocystosis and aspergillosis. CMV, varicella zoster virus, herpes simplex virus, respiratory syncytial virus, parainfluenza and influenza viruses could give a similar picture and are associated with bacterial superinfection.

TREATMENT

The patient underwent bronchoscopy and her bronchoalveolar lavage and blood culture came positive with *R. equi* after 9 days of incubation. Based on the susceptibility, therapy was changed to intravenous vancomycin, imipenem, gentamycin and rifampin.

OUTCOME AND FOLLOW-UP

Even with appropriate antimicrobial therapy and supportive care the patient failed to improve from her septic shock and eventually died of cardiopulmonary arrest.

DISCUSSION

As mentioned previously our case is the fourth in the literature of *R. equi* lung infection in a haematopoietic stem cell transplant recipient; however, the first where the patient died of the severe infection despite appropriate antimicrobial therapy. This case further highlights the virulence of this opportunistic infection in patients with deficient cell-mediated immunity.

The surface soil of 50–95% of horse farms has high concentrations of *R. equi*,⁷ where inhalation of infected aerosols and dust particles seems to be the predominant route of disease transmission.⁸ Our patient stayed on a farm and owned horses which may have put her at risk of acquiring this infection.

Pulmonary infections with *R. equi* are most common and account for around 80% of the reported cases.¹ Pulmonary infection may present as either a nodular infiltrate or a pneumonic consolidation. Pulmonary cavitation frequently occurs and *R. equi* should be considered in the differential of cavitary pneumonia in immunosuppressed patients.

Pathological findings in patients with *R. equi* infection are relatively characteristic and include a dense, histiocytic infiltrate with an eosinophilic, granular cytoplasm and intrahistiocytic

coccobacilli. In some cases due to impaired degradation of ingested bacteria in infected macrophages, there is a formation of concentrically layered basophilic inclusions called Michaelis-Guttman bodies, also known as malakoplakia.^{1,3}

Weinstock and Brown¹ proposed an algorithm for the management of *R. equi* infections in immunocompromised hosts. They recommended an initial treatment with two or more agents to avoid development of resistance. Vancomycin, carbapenems, aminoglycosides, quinolones, macrolide and rifampin are reasonable first choices. An important virulence feature for infection with *R. equi* is its ability to survive in macrophages,⁹ and hence some experts recommend inclusion of antibiotics with intracellular activity, such as rifampicin, macrolide or a quinolone.³ The organism cultured from our patient was resistant to macrolide and quinolone and hence rifampin was included in the antimicrobial combination.

Unfortunately even with appropriate antimicrobial therapy, our patient had a negative outcome. Considering the delayed identification of the organism by our current microbiological methods, the diagnosis of *R. equi* infection was made later in her disease course which could have impacted the patient's outcome. This case highlights the importance of considering the diagnosis of *R. equi* among immunosuppressed patients early in the right clinical setting due to the high virulence associated with this organism.

Learning points

- ▶ *Rhodococcus equi* is an aerobic facultative intracellular organism that is known to infect cells of the macrophage–monocyte lineage.
- ▶ The surface soil of 50–95% of horse farms has high concentrations of *R. equi*, where inhalation of infected aerosols and dust particles seems to be the predominant route of disease transmission.
- ▶ Recommended initial treatment in immunocompromised patients includes two or more active agents to avoid development of resistance.
- ▶ An important virulence feature for infection with *R. equi* is its ability to survive in macrophages, and hence some experts recommend inclusion of antibiotics with intracellular activity.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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