Pyogenic Liver Abscess Due to *Rhodococcus equi* in an Immunocompetent Host

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A case of pyogenic liver abscess (PLA) due to *Rhodococcus equi* in an immunocompetent individual was successfully treated by combining surgery and antibiotics. The *R. equi*-targeted antimicrobial agents erythromycin and rifampin were used only after surgical resection of the lesion and identification of the infective organism.

**CASE REPORT**

A 46-year-old man residing in the suburbs of the city of Rio de Janeiro, Brazil, was admitted to the university hospital with fever (39 to 40°C), right upper quadrant pain, nausea, vomiting, coluria, and weight loss (4 kg in 2 weeks). Abdominal ultrasound was done 2 months before hospitalization and revealed cholelithiasis. He had a history of hospitalization and blood transfusions due to gastric ulcers and melena episodes. He reported a smoking habit and sporadic alcohol ingestion. He denied having used illicit drugs and traveling to rural areas. He also denied hypertension, allergy, diabetes, tuberculosis, or other states of immunodeficiency. Clinical diagnosis revealed jaundice (1+ /4+), paleness (2+/4+), tender hepatomegaly, and signs of dental infection. Abdominal ultrasonographic scanning procedures revealed the presence of two gallstones in the gall bladder and a 6-cm-diameter liver abscess with involvement of the upper and middle segments of the right lobe. There were no clinical or radiological evidences of brain, bone, or lung infection or pleural effusion. Blood samples were collected for bacteriological cultures, and empirical antimicrobial therapy was initiated with intravenous ampicillin, gentamicin, and metronidazole. In view of the clinical signs of purulent gingivitis and periodontitis, ampicillin was changed to penicillin G. Laboratory findings revealed anemia, leucocytosis (35,200 cells/μl), and high levels of liver transaminases and phosphatase alkaline enzymes. The results of screening tests for human immunodeficiency virus and viral hepatitis were negative. On the fifth day after admission, there were still no significant clinical or radiological responses to antibiotics. Until day 25 of hospitalization, the patient remained afebrile with persistent abdominal pain. On day 26, the patient was found to be toxemic and febrile (38.4°C) and started vomiting green vomitus. The patient underwent percutaneous catheter drainage with ultrasound guidance, and 120 ml of chestnut-colored purulent secretion was collected from the abscess. Bacteriological cultures of the liver aspirate were negative. Penicillin G and gentamicin were changed to ceftriaxone and ampicillin. Follow-up of radiological and ultrasonographic scans of the liver indicated persistence of the abscess. Subsequent abdominal computed tomography confirmed the location of the abscess. Fifty days after admission, the patient underwent laparoscopy with drainage of the abscess and cholecystectomy. After surgical drainage and bacteriological identification of the infective organism, the patient was given *R. equi*-targeted antimicrobial therapy (erythromycin and rifampin) for 4 weeks. The patient was discharged from the hospital after the first postoperative week. No recrudescence of *R. equi* infection was observed for the next 2 years. During follow-up, he reported living near a back yard used as a shelter and pasture area for horses. He also received appropriate dental therapy.

Microbiological analysis revealed that all cultures of blood and urine samples were negative. Microscopic examination of stool samples yielded *Strongyloides stercoralis* larvae. Gingival bacteriological cultures were negative for *R. equi*. *R. equi* was recovered from the liver abscess material only after surgical drainage procedures. Direct bacterioscopy revealed irregular gram-positive rods. A pure culture of salmon-colored mucoid colonies appeared on 5% sheep blood agar medium after 24 h of aerobic incubation at 37°C. The microorganisms were identified as *R. equi* by biochemical-conventional methods (5) and the API Coryne System (bioMérieux, Marcy l’Étoile, France; numerical profile, 3 110 004). Results were positive for nitrate, pyrazinamidase, phosphatase alkaline, α-glucuronidase, catalase, and CAMP tests and negative for gelatinase, DNase, urease, esculin, pyrrolidonyl arylamidase, β-galactosidase, β-glucuronidase, N-acetyl-β-glucosaminidase, and carbohydrate fermentation tests. PCR using species-specific primer sequences selected from the 16S rRNA gene sequence was carried out as previously described (4) and gave positive results for the *R. equi* liver isolate (Fig. 1). The *R. equi* strain from the liver was also analyzed by a PCR using primers derived from the sequence of a plasmid gene coding for 15- to 17-kDa virulence-associated antigens (25). In contrast to observations...
with the \textit{R. equi} ATCC 33701 reference strain (75 to 90 kb; virulence plasmid positive), the \textit{R. equi} strain isolated from the liver did not give the expected 567-bp product in PCR amplification (data not shown).

MICs of the following antimicrobial agents were determined by the E-test (19): penicillin (>32 \mu g/ml), clindamycin (0.75 \mu g/ml), tetracycline (1.5 \mu g/ml), vancomycin (0.5 \mu g/ml), gentamicin (1.5 \mu g/ml), imipenem (0.38 \mu g/ml), azithromycin (0.5 \mu g/ml), erythromycin (<0.016 \mu g/ml), and rifampin (≤0.016 \mu g/ml).

Diverse bacterial species have been related to pyogenic liver abscess (PLA) disease worldwide (2, 3, 6, 12, 15, 18, 20, 24). PLA cases due to \textit{Corynebacterium diphtheriae} and coryneform microorganisms have been reported since 1974 (10, 13, 22, 27). Although a substantial increase in reported cases of human infections due to \textit{Rhodococcus equi} (\textit{Corynebacterium equi}) has occurred as a manifestation of the human immunodeficiency virus infection epidemic (5, 26, 28), we did not find in the literature reported cases of PLA due to \textit{R. equi} in either immunocompromised or immunocompetent humans. We believe that this is the first reported case of PLA formation due to \textit{R. equi}. It is also the first case of \textit{R. equi} infection in an immunocompetent host reported in Brazil.

\textit{R. equi} infections have a wide range, varying from localized infection secondary to trauma to fatal systemic infection (1, 5, 7, 16, 17, 23, 26, 28). The mortality rate for \textit{R. equi} infection among immunocompetent patients is ~11%, compared with rates of 20 to 55% among immunocompromised patients, especially those with AIDS. \textit{R. equi} infections in immunocompetent patients are rare, and the majority present with pulmonary involvement. Pulmonary infections account for 42% of reported cases in immunocompetent patients (16, 28). Primary extrapulmonary manifestations are unusual and mainly secondary to hematogenous dissemination (23). The liver is not a known site of \textit{R. equi} infection (1). Our case represents a primary extrapulmonary manifestation in an unusual site that at no time had evidence of pulmonary involvement and hematogenous dissemination. The data will help to identify the pathogenic potential of \textit{R. equi} in immunocompetent individuals and the value of identifying the causative agents in PLA disease.

The significant mortality rate among immunocompetent hosts may be related to inappropriate initial antibiotic therapy (16). Similarly to other cases of \textit{R. equi} extrapulmonary infection in immunocompetent individuals (23), our patient received inappropriate initial antibiotic therapy until bacteriological identification of the infective organism was achieved. Thus, it is important when dealing with PLA patients to suspect a diagnosis of potentially curable \textit{R. equi} infections, which may otherwise be fatal, particularly due to inappropriate initial antibiotic therapy.

Although pharmacological therapy is the treatment of choice, the use of at least two antibiotics in combination has been recommended. Macrolides and rifampin are the agents of choice against the intracellular form of \textit{R. equi} infection (23). In numerous situations, including cases of cerebral abscess, successful treatment of \textit{R. equi} infection in both immunocompetent and immunocompromised patients starts with surgical resection (7, 17, 23). PLA due to \textit{R. equi} has also been effectively treated by combining surgery and the antibiotics erythromycin and rifampin.

PLA due to \textit{R. equi} is yet another case of a relatively avirulent microorganism that exists in the soil of tropical and subtropical countries resulting in a deep-seated infection in a previously healthy person. In our patient, different factors might have contributed to the development of \textit{R. equi} infection. First, the patient had a history of living near the back yard of a horse-breeding establishment, which could have increased his risk of acquiring the infection. The mechanisms of transmission of \textit{R. equi} are variable, including inhalation, ingestion of soil-contaminated products, and direct inoculation (23). The microorganisms are acquired primarily through the air by exposure to animals (5, 28). Secondly, the patient had \textit{S. stercoralis} intestinal infection, which may have favored bacterial colonization of the liver and development of PLA disease due to larval migration through the tissues (21). Finally, the patient had dental disease, which could have favored the development of extrapulmonary focal infection. \textit{R. equi} strains have been found at gingival margins in healthy adults (8), suggesting that the oral cavity may function as a reservoir of the microorganism for focal infection, as previously observed with other bacterial pathogens (11), including in cases of PLA in otherwise healthy hosts (9).

The main source of nutrients for growth in abscesses is likely to be tissue exudates, which are rich in serum-derived proteins and relatively poor in free amino acids and carbohydrates. The capacity to degrade intact proteins is a major determinant of bacterial growth in abscesses (14). Little is known about \textit{R. equi} virulence factors, especially for humans. \textit{R. equi} bacteria are usually incapable of producing proteolytic enzymes under experimental conditions in vitro (5), and 75- to 90-kb virulence plasmid structures were not found to be essential for the development of \textit{R. equi} infection in humans (26). The \textit{R. equi} strain isolated from PLA disease was gelatinase negative and did not exhibit 75- to 90-kb virulence plasmid structures. Additional studies are necessary in order to understand the origin and the pathogenicity of \textit{R. equi} strains related to the development of diverse infectious processes in both immunocompromised and immunocompetent individuals.
REFERENCES


