Bordetella bronchiseptica Pneumonia Post-Liver Resection in a Patient with Liver Cirrhosis and Cholangiocarcinoma

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Abstract

Background: Although *Bordetella bronchiseptica* is primarily an animal pathogen, cases of human disease caused by this pathogen have been published recently, most frequently pneumonia in immunocompromised patients. In human disease, transmission through animal vectors may play a key role. Although no standardized sensitivity testing is available for this pathogen in human disease, animal isolates are sensitive to most β -lactam antibiotics.

Case Report: A 62-year-old Caucasian male with Child-Pugh class A cirrhosis caused by chronic hepatitis C infection underwent uneventful left lateral segmentectomy for a 3 cm cholangiocarcinoma. Within 48 h, he developed altered mental status, temperature of 39.4°C, leukocytosis (white blood cell count: 13,000/mm³), and dyspnea followed by hypotension requiring vasopressor support and intubation. Computed tomography (CT) scan demonstrated left lower lobe pneumonia. Empiric antibiotic therapy including vancomycin (1 g every 12 h) and piperacillin-tazobactam (3.5 g every 6 h) was initiated and his signs of sepsis resolved within two days. *Bordetella bronchiseptica* was cultured from sputum. Upon questioning, the patient reported close contact with several pet cats on the days prior to admission. Antibiotics were continued for a total of seven days and he was discharged in good condition doing well at his six-month follow-up.

Conclusions: Immunocompromised patients may develop infection with *Bordetella bronchiseptica* especially if they are in close contact with animals known to be a reservoir of this pathogen. If diagnosed early and treated appropriately, the outcome is favorable.

BORDETELLA BRONCHISEPTICA is a small, gram negative, rod-shaped bacterium of the genus *Bordetella* [1]. Rarely reported in human beings, it is a common cause of respiratory disease in farm, wild, and pet animals [2,3]. Cats, dogs, rabbits, pigs, cattle, polar bears, sloths, and rodents may harbor this organism [4–6]. *Bordetella bronchiseptica* is closely related to *B. pertussis* but does not express pertussis toxin and is not considered a primary human pathogen [1]. However, an increasing number of *B. bronchiseptica* human infections have been reported recently [7–9]. Immunocompromised patients are affected by the pathogen most commonly [10,11]. A large series of patients with cancer with *B. bronchiseptica* infections was recently published [12]. Pneumonia is the most common manifestation in human beings, however, reports on other infections such as one patient with liver cirrhosis

and spontaneous bacterial peritonitis caused by *B. bronchiseptica* are available [9]. There is evidence that transmission through animal vectors plays a key role [7,8,13–16]. Register et al. [8] documented transmission of *B. bronchiseptica* from a cat to a patient with cystic fibrosis.

Pneumonia is one of the most common infections complicating major surgical procedures [17]. The most common pathogens isolated in this type of infection include *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus*, *Klebsiella* spp., and *Pseudomonas aeruginosa* with a number of additional pathogens to be considered [18]. The longer patients are hospitalized and ventilator dependent, the more likely they are to acquire hospital pathogens, many being multi-drug resistant [19]. Rare organisms including bacteria, viruses, and fungi may be found in patients with

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severe underlying diseases such as renal failure, hepatic failure, diabetes mellitus, and in particular, in severely immunocompromised individuals [18].

Case Report

A 62-year-old Caucasian male with Child-Pugh class A liver cirrhosis caused by chronic hepatitis C infection was diagnosed with a 3 cm lesion in the left lateral liver segments. On biopsy, cholangiocarcinoma was found. He had a history of type 2 diabetes mellitus, peptic ulcer disease, hypertension, depression, and asymptomatic 4 cm abdominal aortic aneurysm. He had no signs or symptoms of liver failure pre-operatively. The first two days after left lateral segmentectomy were uneventful with the exception of persistent altered mental status and disorientation. On the third post-operative day, the patient developed a fever (temperature, 39.4°C), with oxygen saturation of 98% on three liters of oxygen via nasal cannula. The patient progressed to hypotension with his lowest non-invasive blood pressure of 80/45 mm Hg. Norepinephrine at a dose of up to 7 mcg/kg per hour was given and the patient's blood pressure normalized. His incision did not demonstrate any erythema, induration or drainage; his abdomen was non-tender and not distended. International normalized ratio (INR) and total bilirubin peaked at 1.3 and 2.0, respectively; his white blood cell (WBC) count was 13,000/mm³. Computed tomography (CT) demonstrated left lower lobe pneumonia (Fig. 1); there was no intra-abdominal fluid collection. Blood cultures and tracheal aspirates were obtained, followed by administration of vancomycin (1 g every 12 h) and piperacillin-tazobactam (3.5 g every 6 h) empiric therapy. The fever subsided, norepinephrine was weaned within 24 h, oxygenation improved, and oxygen was weaned. His mental status returned to normal over the next two days and the patient continued with an uneventful recovery. Blood cultures remained negative, however, *B. bronchiseptica* was cultured from sputum. Antibiotics were continued for a total of seven days. Upon questioning, the patient reported that he had had close contact with several pet cats on the days prior to surgery. He was discharged home in good condition and did

well on his six-month follow-up with no signs of recurrent infection or tumor.

Discussion

We report a patient with cholangiocarcinoma and liver cirrhosis undergoing a major surgical procedure who developed pneumonia as a result of a rare human pathogen. Although his pets were not tested for carriage of the pathogen, we believe that they are the source of his infection. In the series by Yacoub et al. [12], no clear transmission from pets can be assumed. Redelmann-Sidid et al. [13] reported recently a patient with glioblastoma on temozolomide therapy with kitten-transmitted *B. bronchiseptica* infection. Wernli et al. [7] summarized recently eight cases of *B. bronchiseptica* infection in human beings, the majority of whom had severe underlying disease and three of whom had been exposed to cats. Our patient is only the eleventh reported patient with cancer and the first with malignant disease of the liver with *B. bronchiseptica* infection. We believe that our patient came to the hospital colonized with *B. bronchiseptica* after contact with his pet cats. He was not able to clear the pathogen because of his impaired immune function in the course of his liver cirrhosis and cancer. During intubation, the pathogen may have been introduced into his airways. For peri-operative prophylaxis the patient received a single dose of cefazolin, which did not control growth of the bacterium. Within 48 h he developed pneumonia with signs of hemodynamic instability. Our patient had a dense infiltrate, which corresponds to findings reported recently by Patel et al. [20] in two immunosuppressed patients. Piperacillin-tazobactam was used for empiric therapy in our patient similar to one patient in the series of Yacoub et al. [12] and our patient responded to this therapy. Of note, no clear guidelines are available currently for human infection, however, various agents including β -lactam/ β -lactamase inhibitor combinations, carbapenems, tetracycline, and fluoroquinolones have been used successfully. In the patient reported by Dlamini et al. [9] ciprofloxacin was used because intracellularly active agents may show better response. Animal isolates of *B. bronchiseptica* have

FIG. 1. Computed tomography scan shows dense left lower lobe infiltrate.

been shown to be susceptible to a variety of agents including tetracycline, fluoroquinolones, and β -lactam antibiotics [21,22]. Trimethoprim as well as sulfonamides are considered ineffective. For animals, a nasal immunization is available [23] but this has not been done thus far in human beings.

Immunocompromised patients, including patients with cancer, may develop infection with *B. bronchiseptica* especially if they are in close contact with various animals known to be a reservoir of this pathogen [8,24]. If diagnosed early and treated appropriately, the outcome is favorable.

Author Disclosure Statement

No competing financial interests exist.

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Abbreviations Used

CT = computed tomography
INR = international normalized ratio
WBC = white blood cell

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