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Case report

Bordetella bronchiseptica pneumonia in an immunocompetent pig farmer

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ABSTRACT

Bordetella bronchiseptica is a gram negative bacterium, a common pathogen in respiratory infections of various mammals, mainly dogs and pigs, being extremely rare in humans, occurring in these cases especially in immunosuppressed individuals. We present the case of a male pig breeder with no evidence of immunosuppression, initially focused on possible pulmonary tuberculosis, who was diagnosed of *B. bronchiseptica* pneumonia, successfully treated with fluoroquinolones and doxycycline.

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Introduction

Bordetella bronchiseptica is a bacterium within the phylum *Proteobacteria* and the class *Betaproteobacteria*. It belongs to the order Burkholderiales and the family *Alcaligenaceae*. *B. bronchiseptica* is a small, coccoid-shaped Gram-negative bacterium. It is motile due to peritrichous flagella. In comparison to other *Bordetella spp*., its nutritional requirements are simple [1]. *B. bronchiseptica* plays an important role as a primary and secondary pathogen of the upper respiratory tract in several mammals [2] but is most important and best described in dogs and in pigs [3]. We discuss the case of a male pig breeder who came with symptoms suggestive of respiratory infection, initially misdiagnosed as pulmonary tuberculosis, later identified with *B. bronchiseptica* pneumonia and effectively treated with fluoroquinolones and doxycycline.

Case report

A 68-year-old man with no known drug allergies. A pig breeder by profession, in the past he had been a cattle ranchers and had had contact with dogs. A former smoker of two packs a day for 50 years (100 pack-years), he had an alcohol habit until about 15 years ago. He suffered from gastroesophageal reflux, treated with omeprazole, with no other relevant personal history.

In January 2021 he came to his health center for dysphonia, dyspnea and mucopurulent expectoration of two weeks of evolution. Aerosol therapy, levofloxacin 500 mg one tablet a day for a week, and prednisone 30 mg in a descending regimen were prescribed. He showed little improvement, beginning with involuntary weight loss, a cough with rusty and hemoptoic expectoration, in addition to prominent asthenia. From primary care, a chest radiograph was requested, observing an increase in the frame in the upper and middle left fields, with consolidations, tracts and cavitations (Fig. 1). After these findings, he was referred to the Infectious Diseases consultation due to the suspicion of possible pulmonary tuberculosis.

In our consultation, pulmonary auscultation stood out with abolished vesicular breath sounds in the middle and upper left fields, globally decreased in the rest of the lung fields and dullness on left chest percussion. Chest and neck CT was requested very preferentially, revealing a heterogeneous infiltrative lesion located in the left palatine tonsil, with a low-density component suggestive of necrosis, measuring 16 × 14 × 14 mm. In the left upper lobe and upper segment of the left lower lobe, a solid-cystic opacity was identified, with internal cavitations filled with fluid of intermediate density of approximate dimensions 52 × 39 mm, deviation of the mediastinal structures to the left, component of mixed emphysema in both lung fields and left supraclavicular adenopathy measuring 11 × 11 mm.

We requested flexible bronchoscopy, observing abundant purulent secretions at the level of the left bronchial tree. A

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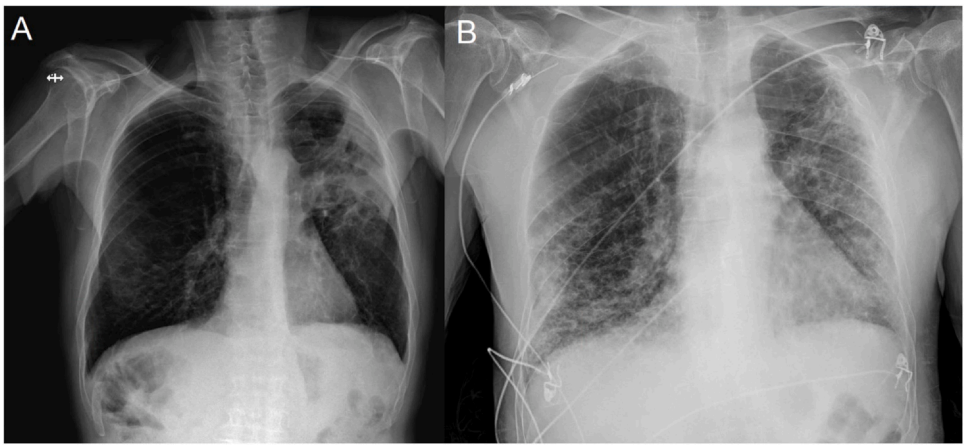

Fig. 1. Chest radiograph before start of treatment (A) and at admission because of COVID-19 (B).

bronchoaspirate (normal culture, mycobacteria and PCR for *Mycobacterium tuberculosis*) was performed, as well as bronchoalveolar lavage. A thoracic ultrasound was performed, showing a lesion at 5 cm of the skin with an air bronchogram, performing 2 biopsies with fine needle aspiration, one for microbiology and the other for pathology.

He was referred to Otolaryngology. Fibroscopy was performed with permeable nostrils, free cavum, orohypopharynx with slight asymmetry, with granulomatous mucosa, especially at the level of the lower pole of the left tonsil, pharyngoepiglottic and vallecula folds, free pyriform sinuses, normal vocal cords, good glottic closure and good light. glottic, oral cavity without notable findings, with soft left palatine tonsil.

Testing was requested showing total proteins 5,4 g/dL (6,4-8,3), C-reactive protein 102,2 mg/L (0–5), hemoglobin 11,7 g/dL (12,5–17,2), leukocytes 16.860/μL with neutrophils 15.410/μL, platelets 451.000/μL and prothrombin time 72% (75–140). He was HIV antibody negative and his PPD was 0 mm of induration at 72 h. Sputum cultures were negative. *M. tuberculosis* PCR was negative. In bronchoalveolar lavage, abundant alveolar macrophages were observed. *Bordetella bronchiseptica* (60,000–100,000 CFU/mL) resistant to cefuroxime and cefotaxime, sensitive to amoxicillin/clavulanic acid, meropenem and levofloxacin, was isolated from a bronchial aspirate culture.

Treatment was started with moxifloxacin 400 mg every 24 h for 14 days. After a week of treatment, he presented significant improvement in cough and without presenting pathological coloration in sputum. In a new analysis, the C-reactive protein dropped to 26,5 mg/L and the leucocytosis with neutrophilia almost normalized.

After fourteen days of treatment, moxifloxacin was discontinued and doxycycline 100 mg every 12 h was started. The patient began to regain weight, the volume of expectoration decreased radically and the cough was sporadic. A reevaluation was planned in two months with a new analysis and radiography, to withdraw antibiotic therapy if the evolution continued to be satisfactory.

Unfortunately, about two months later from the start of antimicrobial therapy, he contracted COVID-19, requiring admission to the Intensive Care Unit and expiring after almost a month of admission. It is worth noting that the radiography at hospital admission, beyond the lesions characteristic of SARS-CoV-2 pneumonia, showed an improvement in the initial radiological findings in relation to *B. bronchiseptica* infection (Fig. 1).

Discussion

B. bronchiseptica has rarely been isolated from humans despite the considerable exposure of humans to animal sources of the microorganism [4]. It is known to infect a wide range of mammals, causing tracheobronchitis in dogs and cats, known as "kennel cough" and atrophic rhinitis in pigs. This organism usually is recognized in immunocompromised or immunoincompetent patients who have at least one predisposing factor, such as severe chronic obstructive pulmonary disease, previous lung transplantation, AIDS [5,6], lung cancer [7], cystic/non-cystic fibrosis and bronchiectasis [8]. While this patient did not have a compromised immune system, undiagnosed chronic obstructive pulmonary disease illness is likely to have exacerbated the infection with *B. bronchiseptica*.

In the case of our patient, there was unquestionably an epidemiological link between his work and his illness. The radiological abnormalities and symptoms, which were first minimal but subsequently florid, were significant [9].

Antimicrobial susceptibility testing is important in both human and veterinary medicine before treating clinical *B. bronchiseptica* infections. The proper in vitro measurement of the antimicrobial susceptibility of *B. bronchiseptica* isolates is critical for predicting the success or failure of an antibacterial therapy. In general, fluoroquinolones and doxycicline are effective against *B. bronchiseptica* [1,10].

In conclusion, beyond immunosuppressed patients, pneumonia due to *B. bronchiseptica* in humans should be suspected, within its low incidence, in patients in regular contact with cattle animals (especially pigs), with respiratory symptoms, given the high risk of progression to severe pneumonia, requiring antibiotic treatment preferably directed according to antibiogram, knowing that quinolones and doxycillin are usually effective treatments in this context.

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Author contributions

José María Barcala Salido, Juan Mora Delgado and Cristina Lojo Cruz contributed following the patient and writing the article.

Ethical approval

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Consent

Consent obtained from relatives for scientific disclosure.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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