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CASE REPORT

Pulmonary exacerbation of cistic fibrosis by Brevibacterium sp in a child: case report and literature review

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Abstract

Cystic fibrosis (CF) is an autosomal recessive disease that usually affects the respiratory tract causing recurrent infections and deterioration of lung function. Other organs such as the digestive system and pancreas are also affected. In this report, we describe an 8-year girl with CF, previously colonized with *Pseudomonas aeruginosa* that developed pulmonary exacerbation not responsive to empiric treatment of broad spectrum antibiotics directed against prior colonization. *Brevibacterium sp.* was detected in culture of bronchoalveolar lavage during bronchoscopy. Antimicrobial treatment was changed to vancomycin, meropenem, amikacin and ciprofloxacin with clinical, laboratorial and radiologic improvement after 23 days of treatment. Patient received discharge 30 days after admission for ambulatory follow-up. Its important that healthcare workers consider the possibility of atypical agents causing pulmonary exacerbation in patients with cystic fibrosis, mainly in children with initial failure of empiric treatment.

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INTRODUCTION

Cystic fibrosis (CF) is an autosomal recessive disease that mainly affects the respiratory system, resulting in chronic infections and deterioration of lung function, in addition to commonly affecting the digestive system and pancreas[1].

Pulmonary exacerbations in children with CF are important causes of morbidity and mortality, with the most common causative agents being Staphylococcus aureus (resistant or not to oxacillin) and Pseudomonas aeruginosa[2]. Due to the difficulty in adequately clearing respiratory secretions, unusual and opportunistic microorganisms have been reported as a cause of respiratory infections, particularly respiratory infections of the lower respiratory tract[3,4].

The Genus Brevibacterium, from the Brevibacteriaceae family, is made up of Gram-positive bacteria, shaped like short, unbranched rods, non-spore forming, with aerobic growth, found in human skin, raw milk and animal sources[5].

There are some reports in the literature of Brevibacterium infection in the form of bacteremia, sepsis, endocarditis in immunosuppressed patients and even sepsis in immunocompetent patients[6-9]. The main risk factor for infection is immunosuppression and the main cause is hospital infection via a catheter[6,9,10]. Considering the recent reports of this opportunistic agent, the objective of this study is to report the case of pneumonia caused by Brevibacterium sp., an emerging and opportunistic pathogen, which should be considered in patients with cystic fibrosis.

CASE REPORT

A.J.M.S., female, 8 years old, 18.4 kg, diagnosed with cystic fibrosis and colonized by Pseudomonas aeruginosa and enterobacteria producing extended spectrum beta-lactamase (ESBL), was admitted to a hospital unit located in Baixada Fluminense, Rio de Janeiro, with tachypnea and respiratory difficulty. She was diagnosed with pulmonary exacerbation in the unit of origin, through physical examination and chest x-ray, and treatment with Cefepime 150 mg/kg/day was initiated. After 17 days of treatment, her respiratory condition worsened and her atelectasis continued. Due to the persistence of symptoms and no clinical improvement, she was transferred to another hospital unit located in the city of Rio de Janeiro to undergo bronchoscopy.

Upon admission to the new unit, the patient was hypocolored (+/4+), rumbling in the respiratory system and scattered crackling rales bilaterally. The chest X-ray showed hypotransparency at the base of the right hemithorax with deviation to the right (figure 1). Computed tomography demonstrated a reduction in the right lung volume, mediastinum and trachea with deviation to the right, atelectasis of the right lower lobe with bilateral interstitial thickening with right predominance and areas of ground-glass attenuation on the left (figure 2)



Figure 1. Chest X-ray upon patient admission.

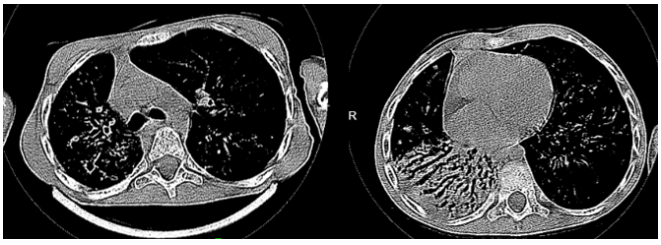


Figure 2. Chest computed tomography on admission 9/9/2022.

CBC with leukocytes of 14,200/mm^3 and 4 sticks, CRP of 0.9 mg/dl (VR <1.0 mg/dl). Negative blood culture and entry screening rectal swab confirmed colonization by Escherichia coli ESBL. The patient required non-invasive ventilation through a face mask for 21 days, nebulization with dornase alfa 12/12/h, hypertonic saline, salbutamol, salmeterol+flucatisone, acetylcysteine and intensive respiratory physiotherapy with 3 periods a day. The patient underwent bronchoscopy, five days after admission, which revealed trachea with signs of inflammation, marked hyperemia and edema, associated with abundant and diffuse thick purulent secretion. At the time of bronchoscopy, a sample of bronchial secretion was collected for culture, which was positive for Brevibacterium sp. The germ does not have an antibiogram standardized by BrCAST, which is the body recommended by the National Health Surveillance Agency (ANVISA) for interpretation standards for antimicrobial susceptibility tests (AST), according to ordinance no. 64 of December 11, 2018 of the Ministry of Health/Health Surveillance Secretariat[11]. There were no reports of isolation of the same germ in other children in the same month as the exam, nor in the environmental samples that are routinely

carried out in the sector. Additionally, no contamination of bronchoscopy equipment was reported due to systematic checking of material reprocessing or isolation of the agent in other children undergoing bronchoscopies.

On the sixth day of hospitalization, the patient presented with fever, worsening of laboratory indicators and significant atelectasis on the chest X-ray. After discussion with the infectious diseases team, the antimicrobial regimen was changed to meropenem, vancomycin, ciprofloxacin and amikacin. On the second day of administration, vancomycin had to be suspended due to a significant allergic reaction, but treatment was resumed on the same day after premedication with systemic corticosteroids. She received a total of 15 days of meropenem and amikacin, 19 days of vancomycin, and 17 days of ciprofloxacin. The patient progressed satisfactorily with clinical, laboratory and radiological improvement with control of a chest tomography performed 29 days after hospitalization and 23 days of antibiotic treatment, there was significant clinical and radiological improvement, but still with atelectasis on the right base and bronchiectasis (figure 3). The patient was discharged after 30 days of hospitalization, with outpatient follow-up with an assistant team. Unfortunately, it was not possible to perform spirometry during hospitalization.

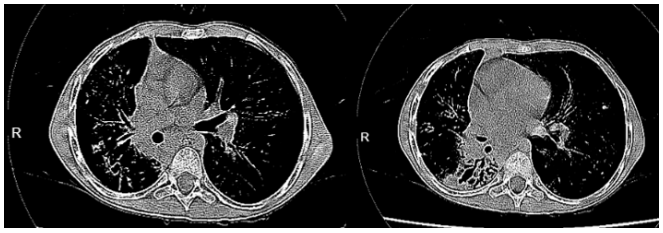


Figure 3. Chest computed tomography performed after 23 days of antibiotic treatment.

DISCUSSION

Brevibacterium is a genus of Gram-positive bacteria that is commonly found in soil, water and dairy products such as cheese[6]. These bacteria were considered non-pathogenic and did not cause disease in healthy humans[6]. To date, around 50 species have been found, 9 of which have been isolated in humans[12]. However, in immunocompromised patients, in diseases such as cystic fibrosis and AIDS, Brevibacterium can cause infections and, as presented in this report, even respiratory infections[5,8]. Furthermore, there is a report of infection in an immunocompetent patient, proving the need for surveillance and attention regarding this pathogen[9].

Despite reports of the isolation of Brevibacterium casei on hospital surfaces in a unit caring for adult patients with cystic fibrosis, there is no report of a similar situation in children. Furthermore, in our case, there was no isolation of the agent in any equipment, environmental sample, equipment or patient in the same period, which rules out the possibility of environmental contamination[13].

In our case, due to the failure of initial broad-spectrum empirical treatment, in another institution, directed against the Gram-negative germs that had previously colonized it, it was necessary to expand the diagnostic investigation by carrying out diagnostic and therapeutic bronchoscopy. Considering the clinical context of the patient with therapeutic failure and evident clinical worsening, the isolated germ was considered pathogenic and treatment was initiated, with an excellent clinical response.

To date, there are few reports of cases of Brevibacterium infection in children. Neumeister, et al reported a case of sternal osteomyelitis caused by Brevibacterium sp in a 4-month-old child with successful treatment with cefazolin and oxacillin[14]. Castagnola, et al described a series of cases of bacteremia caused by unusual germs related to Broviac venous catheters in Italy, with Brevibacterium casei being isolated in blood culture in a child with neuroblastoma[15]. More recently, Bal et al reported a case of bloodstream infection related to a venous catheter in a 6-year-old child with acute leukemia[10]. To our knowledge, this is the first report in the literature of Brevibacterium sp pneumonia in children.

The specific treatment of cases of Brevibacterium infections is not standardized in the literature and previously published studies report a combination of multiple antibiotics, especially glycopeptides, quinolones and catheter removal[10], with vancomycin being one of the most common medications[9,10,12]. Considering previous case reports, we chose to combine vancomycin with meropenem, amikacin and ciprofloxacin, broad-spectrum antibiotics against Gram-negative germs, which proved to be effective in the patient's clinical and radiological improvement. Furthermore, there were no cases of pneumonia described in the literature, therefore, there is no standardized treatment for Brevibacterium pneumonia.

Multidisciplinary monitoring and appropriate treatment are fundamental to improving the quality of life of patients with CF. The patient required physical therapy and nutrition support due to the underlying disease.

CONCLUSION

We present a case of successful treatment of a child with cystic fibrosis diagnosed with pulmonary exacerbation caused by Brevibacterium sp and treated with meropenem and amikacin. It is essential that healthcare professionals consider the possibility of atypical germs in cases of pulmonary exacerbation in patients with cystic fibrosis, especially in cases where there was no initial clinical response to the empirical broad-spectrum treatment.

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