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Eradication of *Mycobacterium abscessus* Pulmonary Infection in a Child With Idiopathic Bronchiectasis

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Case Report

An 8-year-old female presents to the pulmonary clinic for management of her persistent asthma. She was diagnosed with asthma at 4 years of age due to recurrent episodes of albuterol-responsive wheezing. In addition to her asthma history, she had 6 to 8 episodes of bronchitis treated with antibiotics every year, as well as 2 episodes of pneumonia and 1 diagnosis of sinusitis. At presentation, she had a chronic, wet daily cough that was worse in the morning, with exercise, and with smoke exposure.

Her past medical history was notable for failure to thrive, idiopathic short stature (actively being treated with growth hormone), allergic rhinitis, and mild persistent asthma with multiple respiratory infections as described above. History revealed daily cough with sputum production and shortness of breath with exercise. Physical examination showed a small for age child (height and weight both below the 3rd percentile) with coarse inspiratory crackles and wheeze throughout lung fields.

Based on her past medical history and abnormal lung exam, a cystic fibrosis workup was initiated. Spirometry was normal with forced expiratory volume in 1 second (FEV1) of 90.4% predicted. Chest radiography and sinus computed tomography (CT) were normal. However, chest CT demonstrated multifocal tree-in-bud opacities with associated diffuse bronchiectasis and ground glass opacities, suggestive of atypical infection, as well as a wedge-shaped process in the right middle lobe concerning for developing pneumonia (Figure 1). She had 2 normal sweat chloride tests and normal cystic fibrosis transmembrane regulator gene sequence. Primary ciliary dyskinesia evaluation identified normal ciliary ultrastructure and a normal genetic screen. Immunologic evaluation supported normal immune status, with normal immunoglobulin levels, lymphocyte number and function, and appropriate response to vaccination. She underwent bronchoscopy, and bronchoalveloar lavage (BAL) resulted in a negative viral and fungal cultures, but grew *Streptococcus pneumoniae* and *Mycobacterium abscessus* from bacterial cultures. She was treated with amoxicillin and clavulanate for pneumococcal pneumonia. After 21 days of treatment, she had decreased cough and sputum production, with increased FEV1 to 97.8%.

Over several months, her respiratory symptoms worsened, and she acutely developed a new daily productive cough and decline in spirometry to an FEV1 of 87.8% predicted (Figure 2). She was admitted and completed a 14-day course of intravenous (IV) clindamycin and piperacilllin-tazobactam for persistent pneumococcal infection. At time of discharge, her FEV1 was 111.6% predicted, and all sputum cultures, including AFB and fungal, were negative.

However, 1 month later, she was readmitted for a bronchiectasis exacerbation presenting as fever, emesis, increased cough, new-onset sputum production, and a declining FEV1 of 65.8% predicted. Sputum cultures were positive for *M abscessus*, with no growth on the respiratory or fungal cultures. Due to the rapid clinical decline, treatment for *M abscessus* was initiated with tigecycline 50 mg IV daily, azithromycin 250 mg orally daily, and tobramycin 300 mg inhaled twice daily. Tigecycline was chosen due to *M abscessus* resistance to amikacin, with intermediate sensitivities to cefoxitin and imipenem. Over her weeklong admission, the patient had improvement in symptoms and spirometry with an FEV1 of 110.5%. Patient was discharged with a Port-a-cath for continued home triple antibiotic therapy.

At her 2-month follow-up, the patient had significant improvement in lung exam with resolution of adventitial breath sounds, decreased sputum production, and

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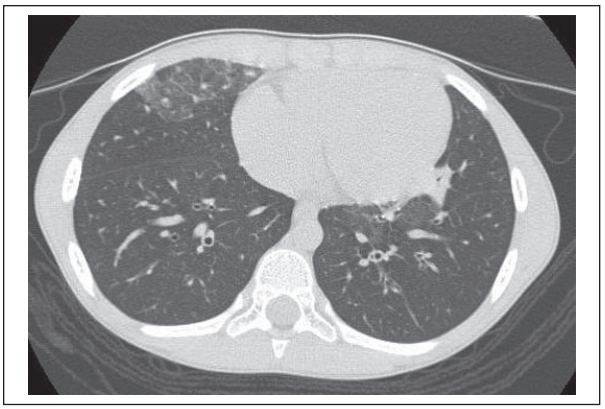

Figure 1. Chest CT with multifocal tree-in-bud opacities, diffuse bronchiectasis, and ground glass opacities.

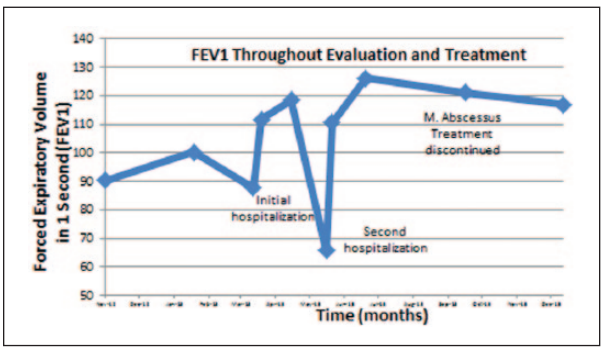

Figure 2. FEV1 throughout evaluation and treatment.

improved spirometry with an FEV1 of 125% predicted. Repeat bronchoscopy was performed, and all cultures were negative. Pathology of BAL revealed benign bronchial epithelial cells and pulmonary macrophages, without hemosiderin-laden macrophages. After 5 months of treatment, antibiotics were discontinued, and the patient remained asymptomatic. Monthly surveillance spirometry has remained above 100% predicted, and respiratory cultures remained negative for *M abscessus* for over 6 months.

Discussion

Mycobacterium abscessus is a significant cause of nontuberculous mycobacterium infection in patients with bronchiectasis. Transmission generally occurs with acquisition from water or soil in the environment. Pulmonary infection with *M abscessus* is an important cause of morbidity by progressive decline in lung function that can eventually lead to death.

Most *M abscessus* pulmonary infections in pediatric patients are seen in the setting of underlying lung pathology with bronchiectasis, especially in patients with cystic fibrosis. Studies have estimated prevalence of nontuberculous mycobacterium infections of 4% to 8% of patients with cystic fibrosis.[1] Cystic fibrosis was suspected, but ruled out in our patient.

In otherwise healthy children, *M abscessus* can cause cervical lymphadenopathy, though there are case reports of immunocompetent, healthy children with nontuberculous mycobacterial infections causing hilar lymphadenitis or endobronchial lesions, which can obstruct the airway, providing a nidus for parenchymal infection.[2] These patients were successfully treated with surgical resection and prolonged courses of antibiotics. There are also case reports of *M abscessus* infection in a toddler with a tracheostomy,[3] as well as one reported outbreak in a pediatric intensive care unit.[4] In our patient, her underlying bronchiectasis, likely secondary to previous pneumonias, provided the environment for *M abscessus* growth.

American Thoracic Society guidelines are based on expert opinion (level of evidence is C—poor) and recommend treatment with a macrolide plus and additional parenteral agent (amikacin, cefoxitin, or imipenem).[5] As recently as 2012, a Cochrane review noted that there are no published trials comparing treatments for *M abscessus* infections.[6] The treatment regimen for this patient included the ATS-recommended macrolide, but deviated from the recommended parenteral agents, substituting tigecycline, a drug in a different class than the recommended IV aminoglycoside, cephalosporin, or carbapenem. Tigecycline is a glycylcycline antibiotic that inhibits protein synthesis by binding to the 30S subunit of the ribosome. In addition, our treatment regimen included an additional inhaled aminoglycoside antibiotic, tobramycin.

Our patient exhibited rapid improvement after only 2 months of treatment and tolerated treatment without medication side effects. In addition, she had normal BAL after only 2 months of antibiotics with no recurrence of symptoms after completion of treatment. This is in stark contrast to the usual course of *M abscessus* infection, which usually proves difficult to treat and eradicate, leaving the patient with chronic *M abscessus* infection or colonization.

Our case highlights several key points. First, in children with underlying lung pathology, particularly bronchiectasis, presenting with pulmonary exacerbations, a high index of suspicion should be maintained for atypical nontuberculous bacterial infections, including *M abscessus*. Second, we present a well-tolerated, effective, novel approach to treatment of *M abscessus* in a pediatric patient. Finally, early identification of this pathogen allows for expeditious treatment, improved outcomes, and possible infection eradication for the pediatric patients with *M abscessus* infection.

Author Contributions

SKA: Contributed to conception and design; drafted manuscript; critically revised manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy.

SKW: Contributed to design; critically revised manuscript; gave final approval.

JEG: Contributed to conception and design; critically revised manuscript; gave final approval.

Authors' Note

The views expressed in this article are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the US Government.

Declaration of Conflicting Interests

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