CASE REPORT

Nocardia lung abscess in an immunocompetent adolescentDiana Soares,¹ Ana Reis-Melo,² Catarina Ferraz,³ Luisa Guedes Vaz³¹Department of Pediatrics, Centro Hospitalar Vila Nova de Gaia - Espinho EPE, Vila Nova de Gaia, Portugal²Department of Pediatrics, Centro Hospitalar São João EPE, Porto, Portugal³Pediatric Pulmonology Unit, Department of Pediatrics, Centro Hospitalar São João EPE, Porto, Portugal

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SUMMARY

The authors report a case of a lung abscess caused by *Nocardia* sp. in a previously healthy adolescent. A 17-year-old young man presented with tonsillitis that did not respond to β -lactamic antibiotic, dyspnoea and thoracic pain. The X-ray revealed a cavitation in the right pulmonary upper lobe. He was admitted and completed a 14-day empirical antimicrobial therapy for a pulmonary abscess, although no clinical recovery was observed. He then underwent pulmonary biopsy of the lesion and PCR analysis of the collected pulmonary tissue, which revealed the presence of *Nocardia*. This case emphasises the importance of considering nocardiosis in the differential diagnosis of a lung abscess, particularly if no response to empirical therapy is obtained.

BACKGROUND

Nocardia sp. is a gram-positive bacteria from the genus of aerobic actinomycetes found in soil that has the ability to cause localised suppurative disease (mostly pulmonary, central nervous system, cutaneous or lymphocutaneous involvement) or systemic disease. To the present date, 85 species of *Nocardia* have been identified, 25 of which cause disease in humans.¹ Although it is frequently associated with immunodeficiency (particularly deficient cell-mediated immunity), up to one-third of the patients affected by *Nocardia* infection are immunocompetent.²

CASE PRESENTATION

A previously healthy 17-year-old young man was admitted in the emergency room with low-grade fever (37.8°C), odynophagia, bilious vomiting and thoracic pain. The patient was on day 2 of amoxicillin/clavulanate (every 12 hours) for a pultaceous tonsillitis previously diagnosed by the general practitioner, but bacterial culture was not obtained. On admission, exudate was seen on tonsils and there were no signs of peritonsillar abscess. Pulmonary auscultation was normal and no lymphadenopathy was present. The remaining physical examination was unremarkable. Chest X-ray revealed an interstitial infiltrate in the right upper lobe (figure 1). On blood tests, the haemoglobin level was 168 g/L, the total white cell count was $12.02 \times 10^9/L$ with 86.5% neutrophils ($10.40 \times 10^9/L$) and 2.8% lymphocytes ($0.34 \times 10^9/L/\mu L$). Serum C reactive protein (CRP) was 130.2 mg/L. Heterophile antibody test was negative. The patient was discharged with increased dose of amoxicillin/clavulanate (every 8 hours) and

fever was resolved after 1 day. Eight days later, the adolescent returned to the emergency room with recrudescence of fever (37.8°C), thoracic pain and dyspnoea and he was polypneic (respiratory rate of 36 breaths/min). He had completed 10 days of antibiotic. Laboratory studies demonstrated white cell count of $19.50 \times 10^9/L$ with 76.9% of neutrophils ($14.995 \times 10^9/L$) and 12.1% of lymphocytes ($2.36 \times 10^9/L$) and CRP of 90.2 mg/L. ECG was normal and cardiac enzymes were negative. The second chest X-ray revealed a cavitory lesion on the right upper lobe (figure 2). Due to lung abscess, he was admitted for empiric antimicrobial therapy with intravenous ceftriaxone (4 g, daily) and clindamycin (700 mg, every 6 hour) and oral azithromycin (500 mg, daily).

The patient went camping 3 weeks before the onset of the disease but there was no recent history of travels abroad. He reported a history of sporadic alcohol abuse during camping, but no tobacco or illicit drug use. He denied recurrent alcoholism.

INVESTIGATIONS

Multiple blood cultures were negative. Cytomegalovirus and HIV serum detection were negative. *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, *C. psittaci*, *Bordetella pertussis* and *B. parapertussis* PCR detection on sputum were all negative. Urinary legionella and pneumococcal antigens were negative. The thoracic CT scan revealed a cavitory lesion with dense margins and air fluid level inside, measuring $60 \times 60 \times 54$ mm in the right upper lobe

Figure 1 Interstitial pulmonary infiltrates at day 2.

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Figure 2 Cavitary lesion in the right upper lobe at day 10.

(figure 3). There were no mediastinal or hilar lymphadenopathies. *Mycobacterium tuberculosis* PCR detection on sputum was also negative. After 14 days of intravenous antibiotic therapy, there was resolution of dyspnoea, but he maintained cough, thoracic pain and intermittent low-grade fever. A CT-guided biopsy of the lesion was conducted. Aerobic, anaerobic, mycological and mycobacterial cultures of the pulmonary tissue were negative. The histopathology analysis excluded malignancy. PCR analysis of the pulmonary tissue revealed nocardiosis. All other PCR studies (*M. pneumoniae*, *C. pneumoniae*, *Streptococcus pneumoniae*, *Aspergillus fumigatus*, *Candida albicans*, *M. intracellulare* and *M. tuberculosis* complex) were negative. Investigation for autoimmune disease and immunodeficiency revealed normal findings including antinuclear antibodies, anti-neutrophil cytoplasmic antibody, antidouble-stranded DNA, as well as alpha-1 antitrypsin, lymphocyte immunophenotyping, immunoglobulins and immunoglobulin subclasses, response to polysaccharide antigens and complement activity.

Because *Nocardia* sp. has a special tropism for the neural tissue,^{3 4} a brain CT scan was performed and revealed normal findings. A cervical Doppler ultrasound was also done to exclude Lemierre's syndrome.

TREATMENT

Based on the PCR result, the therapy was switched to intravenous imipenem (500 mg, every 6 hour) and oral trimethoprim/sulfamethoxazole (TMP/SMX) (800 mg/160 mg, every 8 hour)

Figure 3 Thoracic CT scan revealed a lesion measuring 60×60×54 mm. (A) Transverse and (B) coronal views.

Figure 4 Control thoracic CT scan 1 month after the completion of therapy.

for 2 weeks. The total therapy period was 10 months with TMP/SMX monotherapy.

OUTCOME AND FOLLOW-UP

There was clinical recovery of the patient after 2 weeks of therapy. After 1 month of TMP–SMX monotherapy, the CT scan showed a marked reduction of the lesion (20×18 mm) (figure 4). During the follow-up, the patient's HIV status remained negative.

DISCUSSION

We present a case of pulmonary nocardiosis in an immunocompetent adolescent boy. The clinical presentation of pulmonary nocardiosis is non-specific and chest radiograph normally reveals lesions in the superior lobe that are often attributed to other causes, delaying the correct diagnosis.

A differential diagnosis for a lung cavity should include infectious bacterial causes as anaerobic (*Peptostreptococcus*, *Prevotella*, *Bacteroides* and *Fusobacterium* sp.) and aerobic (*S. anginosus*, *S. aureus*, *K. pneumoniae*, *S. pyogenes*, *Burkholderia pseudomallei*, *Haemophilus influenzae* type b, *Legionella*, *Nocardia* and *Actinomyces*) agents, but usually there is a polymicrobial infection. Non-bacterial pathogens as *M. tuberculosis*, non-tuberculous mycobacteria and fungal infections (*Aspergillus* sp.) should also be considered. Non-infectious causes include malignancies (primary and secondary lung cancer) and vasculitis. Anatomic definition of a lung cavity can be achieved with CT scan, including the involvement of the parenchymal or pleural tissue, if there are single or multiple lesions, and also the presence of underlying conditions. Based on the age of the patient, previous healthy status and clinical and radiological presentation, a bacterial cause for the lung abscess was first considered. Typically, lung abscesses are associated with predisposition to aspiration. In our case, a history of sporadic alcohol abuse and persistent vomiting at the same point was reported. The identification of the aetiological agent allows the selection of the appropriate antibiotic therapy and is the most important component in the management of a lung abscess. Therefore, multiple samples were collected at the time of patient admission and before the initiation of empirical antimicrobial therapy. We also performed cervical Doppler ultrasound to exclude jugular vein suppurative thrombophlebitis, which together with pharyngeal

infection involving the neck and the carotid sheath, bacteraemia and septic emboli to the lung, characterise Lemierre's syndrome.

The lack of response after 14 days of intravenous empirical antibiotic therapy (ceftriaxone, clindamycin and azithromycin) covering the most common bacterial aetiologies, together with negative microbiological studies, prompted us to obtain additional samples for *in vitro* culture and PCR studies, through an invasive procedure (lung biopsy). Aerobic, anaerobic, mycological and mycobacterial cultures of the lung tissue were negative and the histopathology analysis excluded malignancy.

A positive PCR result for *Nocardia* sp. led to the final diagnosis of pulmonary nocardiosis and to the change of antibiotic therapy to imipenem and TMP/SMX. In our case, PCR studies from the lung tissue took longer than expected; if PCR results had been obtained within the first days of empirical therapy, the initial bacteriological cultures could have been established for longer (to identify *Nocardia* sp.) and directed treatment could have started earlier. Because there were no risk factors for nocardiosis,³ the first bacterial cultures were not monitored for an adequate period of time, required to detect *Nocardia* sp. The following cultures were negative but the patient was already under antimicrobial therapy. We believe that this case emphasises the importance of considering less common agents in a timely manner, particularly when there is no adequate response to empirical therapy. Moreover, it is important to alert the laboratory about the clinical evolution and maintain long incubation times that permit the growth of indolent agents.⁵ Our case obviates therefore the need for a close interaction between the clinician and the microbiologist.

Although pulmonary nocardiosis often starts with the invasion of the respiratory tract,⁵ it can also follow dental or periodontal infections and there is a report of nocardiosis with a peritonsillar abscess.⁶ In our patient, there was a purulent tonsillitis not responsive to empirical therapy for the most causative agents, suggesting an alternative resistant agent as the aetiology. It is plausible that infection may have started after inoculation of the tonsillar tissue followed by aspiration to the respiratory tract favoured by protracted vomiting.⁵

Learning points

- This case considers unusual agents that cause pulmonary abscess, even in the absence of known risk factors.
- This case recognises the importance of using PCR, especially if antibiotic treatment has been previously initiated.
- This case promotes a close partnership between the attending clinician and the microbiologist to efficiently explore the samples obtained from the patient.

There are few documented cases of pulmonary nocardiosis affecting adult immunocompetent patients,^{7–9} and they are mostly associated with pulmonary chronic disease (such as bronchiectasis, chronic obstructive pulmonary disease or asthma).^{10–13} There are also reports of previously healthy children having nocardiosis associated with pneumonia and pleural effusion, central nervous system infection and septic arthritis.^{14–17}

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