CASE REPORT

An atypical presentation of a typical pulmonary pathogen in an immunosuppressed patient

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SUMMARY

We describe a case of a 38-year-old, HIV-positive asthmatic man with a history of intravenous methamphetamine substance misuse who presented with worsening dyspnoea, wheeze, productive cough without haemoptysis and deteriorating exercise tolerance. His chest X-ray was clear and subsequent CT scanning demonstrated multilobar, patchy consolidation and ground glass change in the lung parenchyma. His CD4 count was 864 cells/mm³ (n=500–1500 cells/mm³) and viral load 863 IU/mL. Our primary diagnosis was an atypical pneumonia with associated bronchospasm. The differential diagnosis also included a methamphetamine-induced pulmonary haemorrhage, given the multiple small foci of ground glass change. The patient's sputum cultured *Haemophilus influenzae*, which was somewhat surprising, given his unusual CT findings. He recovered with antibiotic therapy and a follow-up CT scan at 6 weeks revealed complete resolution of the radiological findings.

BACKGROUND

It is essential that we maintain a high index of suspicion for the presence of atypical microorganisms in immunosuppressed patients with symptoms of infection. Specifically, in patients with HIV, infective symptoms on a history of falling CD4 count and increasing viral load may indicate progression to AIDS. The famous saying in medicine, 'common things are common', still applies in the immunosuppressed patient who is at risk of a plethora of different infections, which includes the pathogenic transformation of commensal organisms. While we must always consider unusual microorganisms in HIV-positive individuals, a 'barn door' respiratory bacterium such as *Haemophilus influenzae* may still be the causative pathogen. The earlier this is identified during admission, the sooner antibiotic therapy can be rationalised, minimising the need for broad-spectrum empirical therapy, which is associated with systemic side effects and may promote antibiotic resistance. As highlighted by the results of the investigations in this case, common microorganisms can still present with atypical features on imaging.

CASE PRESENTATION

A 38-year-old man with a history of HIV, adolescent-onset asthma and methamphetamine intravenous drug use, presented to the emergency department with shortness of breath, a productive cough of green sputum, left-sided pleuritic chest pain and sweats. Prior to this acute illness, his asthma control had deteriorated over the past

4 months on a history of recent stress with a gradual reduction in exercise tolerance and increased use of his salbutamol inhaler. He continued to take his regular beclomethasone inhaler two times per day as prescribed. There was neither haemoptysis nor any risk factors for pulmonary embolism (PE).

The patient's asthma was diagnosed during university, after presenting with cough and wheeze, which was treated with regular inhaled beclomethasone and salbutamol, as required; since then, he has had no hospital admissions for exacerbations. Prior to admission, he had routine blood test to monitor his HIV: his CD4 count was 864 cells/mm³ (n=500–1500 cells/mm³) and viral load was 863 IU/mL. In view of his relatively low viral load (<1000 IU/mL) and relatively high CD4 count, he was not receiving highly active antiretroviral therapy or prophylactic co-trimoxazole. The patient had also made a recent decision to start a drug rehabilitation programme for his misuse of intravenous crystal methamphetamine. At home, he was completely independent and able to carry out all activities of daily living. He was also an ex-smoker.

On examination, he was tachypnoeic and diaphoretic, with oxygen saturations of 94% on air. Chest auscultation revealed widespread expiratory polyphonic wheeze bilaterally with reduced air entry at the lung bases.

INVESTIGATIONS

Blood tests on admission revealed C reactive protein (CRP) of 31 mg/L (n=0–10), white cell count (WCC) of 12.0×10⁹/L (n=4.0–11.0) and a positive D-dimer. Arterial blood gas on air showed a PaO₂ of 9.57 kPa. A plain film chest radiograph showed no focal consolidation. In view of the clinical presentation and positive D-dimer, a CT pulmonary angiogram (CTPA) was arranged to exclude a PE. The scan did not show any pulmonary arterial filling defects but did reveal patchy consolidation and multifocal ground-glass shadowing bilaterally with some minor air trapping, highly suggestive of atypical pulmonary infection (figures 1–3). A sputum sample was sent for microscopy, culture and sensitivity, in addition to a urine sample for *Legionella* and pneumococcal antigens, both of which were negative. A blood sample was also sent for mycoplasma serology to complete the screen recommended by the microbiologists.

DIFFERENTIAL DIAGNOSIS

Taking into account the patient's initial presentation and clinical findings, our differential diagnosis

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Figure 1 CT of the chest—apical lung slices. *Admission CT red arrow: small lung opacity.

included community acquired pneumonia secondary to an 'atypical organism', an infective exacerbation of asthma, PE and pulmonary haemorrhage secondary to injectable methamphetamine. The latter diagnosis was considered after concern that insoluble material injected intravenously may damage the integrity of the pulmonary vasculature.

TREATMENT

Our primary diagnosis was pneumonia with an associated exacerbation of asthma. In view of his penicillin allergy, he was initially treated with intravenous teicoplanin and clarithromycin in accordance with the hospital's antibiotic policy for community-acquired pneumonia in penicillin-allergic patients. This was supplemented with regular salbutamol nebulisers and oxygen therapy. Treatment dose dalteparin was converted to prophylactic dalteparin after exclusion of a PE on the CTPA.

The patient responded biochemically to intravenous antibiotics with improvement in the CRP and WCC by day 5 of admission. Clinically, he remained diaphoretic and wheezy. On day 5, his sputum microbiology cultured *H. influenzae*, resistant to both teicoplanin and clarithromycin, but sensitive to amoxicillin and ciprofloxacin. It remains unknown whether the bacteria cultured represented the original causative pathogen or a resistant strain that had prevailed following antibiotic therapy. We rationalised his antibiotic regime to oral ciprofloxacin.

Figure 2 CT of the chest—lung base slices. *Admission CT red and blue arrows: areas of patchy consolidation.

Figure 3 CT of the chest—carina lung slices. *Admission CT red arrow: patchy consolidation, blue arrow: ground glass shadowing.

OUTCOME AND FOLLOW-UP

The patient recovered completely on oral antibiotics, and once weaned from regular nebulisers and oxygen therapy, was discharged to a drug rehabilitation centre with a plan for follow-up in chest clinic after 6 weeks. In view of his poor asthmatic control, we initiated a budesonide/formoterol inhaler on discharge. A repeat CT scan at 6 weeks showed complete resolution of the multifocal patchy ground-glass change (figures 1–3). This suggests that the atypical features represented acute infection with *H. influenzae* and not pulmonary haemorrhage secondary to intravenous methamphetamine use.

DISCUSSION

While the incidence of bacterial pneumonia increases with a falling CD4 count in HIV-infected individuals, it remains a highly prevalent condition even with CD4 counts of over 500 cells/mm³.¹ A review of the literature suggests that the microorganisms most commonly responsible for bacterial pneumonia in HIV-infected individuals are *Streptococcus pneumoniae* and *H. influenzae*; identical to the causative pathogens in immunocompetent individuals.^{1 2} However the same microorganisms may result in a more variable presentation in the immunosuppressed, which includes atypical imaging findings. While a pneumococcal pneumonia usually presents with focal consolidation on chest radiography, in HIV-positive patients, the changes may be more widespread, diffuse and multilobar.³ Consequently, a CT of the chest is invaluable in evaluating the lung parenchyma when presented with equivocal changes on plain film radiography.⁴ With such variable presentations on imaging in immunosuppressed individuals providing little clue to the aetiology, it is crucial to detect the pathogen quickly. As standard culture methods will only diagnose the pathogen in 35% of cases, one study emphasises the importance of urinary antigen testing to aid rapid identification of pneumococcal pneumonia;² a condition that requires only monotherapy with a narrow-spectrum antimicrobial.

It is also important to consider the potential local immunomodulatory impact of inhaled steroid therapy as a contributing factor to this patient's presentation. Although inhaled corticosteroids are known to increase the risk of pneumonia in patients with chronic obstructive pulmonary disease, this risk has not been consistently demonstrated in trials on asthmatics.⁵ Furthermore, there is no published data exploring the relative risk of pneumonia of inhaled corticosteroids in the HIV population.

Patient's perspective

- ▶ "Being HIV positive and not yet requiring treatment with HAART, I suppose one is always mindful of the day which will eventually come when the virus has made sufficient inroads so as to significantly impair my immune system. With my asthma worsening, the development of pneumonia seemed to signify that the time had come.
- ▶ My addiction to methamphetamine, in part the consequence of unresolved acceptance of my HIV diagnosis, was also clearly a possible cause. Like many patients in our world of information overload, it was not difficult to read up on the risk of PE, and add this factor to the list of possible self-inflicted origins of my pneumonia.
- ▶ Although I did not feel overly despairing at the time, question marks hung over a definitive diagnosis and aetiology for my pneumonia. Was this the consequence of intravenous drug use? Was this deterioration in my CD4 count? Although I clinically improved with IV antibiotics, the slight paranoid in me worried that the unusual presentation of my imaging could have meant something more sinister was at play.
- ▶ Thankfully, all was fairly straightforward and garden variety in the end. Needless to say, although I had already planned my impatient stay at a treatment centre for substance misuse, the somewhat heightened drama of the whole episode served to give real fervour to my recovery. For that reason I am grateful that events transpired as they did. However, in the interests of other patients as well as our health system's allocation of funds, it is clear that lessons learnt from my case can be put to much wider benefit."

There are no case reports specifically reporting the pulmonary complications of intravenous methamphetamine, but a review of illicit drug use in general does summarise the potential thoracic complications of intravenous substance misuse.⁶ Gotway *et al* report that the increased incidence of pneumonia seen in intravenous drug users likely stems from contaminated equipment and skin colonisation with more virulent pathogens. Additionally, these individuals are commonly immunosuppressed due to a history of HIV infection. Acute lung injury is seen when intravenous or inhaled agents alter the pulmonary capillary endothelial

Learning points

- ▶ Common things are common.
- ▶ Typical pathogens can present with atypical features on imaging in immunosuppressed patients.
- ▶ Always consider the effects of intravenous drug use as a differential diagnosis in pulmonary disease.
- ▶ Obtain a sample for microbiology as soon as possible in patients presenting with infection to focus antibiotic therapy sooner rather than later.
- ▶ Always consider stepping up inhaled therapy in asthmatics with deteriorating symptom control.

permeability by unknown mechanisms.⁷ The most interesting complication that can be extrapolated to this case, is the development of pulmonary haemorrhage. On CT scan, this presents as bilateral, multifocal regions of ground glass,^{6 7} not dissimilar to those identified in this case. These findings are, however, usually accompanied by an acute presentation of haemoptysis.

Contributors LEU wrote and submitted the report. PS reviewed the finalised report and also contributed to the writing.

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