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CASE REPORT

Pneumonia due to pandemic (H1N1) 2009 influenza virus and *Klebsiella pneumoniae* capsular serotype K16 in a patient with nasopharyngeal cancer

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Streptococcus pneumoniae, *Haemophilus influenzae*, *Staphylococcus aureus* and group A *Streptoccocus*, but no *Klebsiella pneumoniae* were responsible for bacterial coinfections during the 2009 and previous influenza pandemics. We hereby report a case with concurrent bacteremic pneumonia due to an unusual capsular serotype K16 *K. pneumoniae* and pandemic (H1N1) 2009 influenza in a patient with nasopharyngeal cancer. Such a coinfection has not previously been described.

Introduction

Pandemic (H1N1) 2009 influenza is an emerging disease that has rapidly spread worldwide since the first two cases were recognized in April 2009.[1] A study found that 22 (29%) out of 77 fatal cases of severe pandemic (H1N1) 2009 pneumonia were accompanied by concurrent bacterial pneumonia, and

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Streptococcus pneumoniae was the most common copathogen.[2] Here we report a case with concurrent pandemic (H1N1) 2009 and bacterial pneumonia due to capsular serotype 16 *Klebsiella pneumoniae* in a patient with nasopharyngeal cancer.

Case report

A 42-year-old man presented with fever, productive cough, myalgia and progressive dyspnea for three days. Three days before, he had visited a local hospital due to the sudden onset of fever and cough. The rapid influenza test of a nasopharyngeal swab sample was positive for influenza A. He had been given oseltamivir 75 mg twice daily on November 23 but there had been no significant improvement in his symptoms.

The patient had a history of nasopharyngeal cancer diagnosed in 1995 and had been treated by radiotherapy. He did not recall any history of influenza vaccine. Influenza A was diagnosed in this patient and four of his companions during recent travel in China from November 19 to November 23, 2009. He reported no headache, abdominal pain, vomiting or diarrhea.

On examination, his body mass index was 17.2 kg/m2 and vital signs were temperature 38.9°C, pulse rate 134 beats/min, respiratory rate 26 breaths/min, blood pressure 104/71 mmHg, and SpO2 76% under ambient air. Physical examination was unremarkable, except for bilateral coarse crackles on chest auscultation.

Results of laboratory tests were as follows:

- white blood cell count 4480 cells/mm^3 (77% neutrophils and 17% lymphocytes);
- hematocrit, 41%;
- platelet count, 236,000 cells/mm^3;
- serum creatinine, 0.8 mg/dL;
- asparatate aminotransferase, 49 U/L (normal $<$37 U/L); and
- C-reactive protein, 31.48 mg/dL (normal $<$0.8 mg/dL).

Arterial blood gas analysis under oxygen therapy via a non-rebreathing mask revealed the following: pH 7.43, PCO_2 41.2 mmHg, and PO_2 134 mmHg. Chest radiography showed bilateral consolidations (Fig. 1).

The patient was intubated for hypoxemic respiratory failure and admitted to the intensive care unit. Nasopharyngeal swab specimen for *Chlamydia pneumoniae* antigen (bioMerieux, Marcy-I'Etolite, France) was negative. Serological tests for anti-*Mycoplasma pneumoniae* IgM (Savyon Diagnostics Ltd., Ashdod, Israel), Binax NOW *S pneumoniae* urinary antigen test (Binax Inc., Portland, ME, USA) and *Legionella* urinary antigen test for serogroup 1 (Binax Inc.) were all negative. The influenza rapid test (QuickVue Influenza A+B test, Biomerieux, San Diego, CA, USA) for a nasopharyngeal swab sample remained positive for influenza A. An in-house real-time reverse-transcriptase polymerase chain reaction (PCR) can detect pandemic (H1N1) 2009 influenza virus in a nasopharyngeal swab.

The patient's poor initial response to oseltamivir meant that the dose of oseltamivir was doubled to 150 mg twice daily. Intravenous levofloxacin (750 mg daily) was empirically prescribed for suspected coexisting bacterial pneumonia, and was then switched to ceftazidime 2 g every 8 hours. The isolates of *K pneumoniae*, which grew in both sputum and blood samples collected on the day of admission, were only resistant to ampicillin. He was extubated on the fifth day in hospital and transferred to a general ward 3 days later.

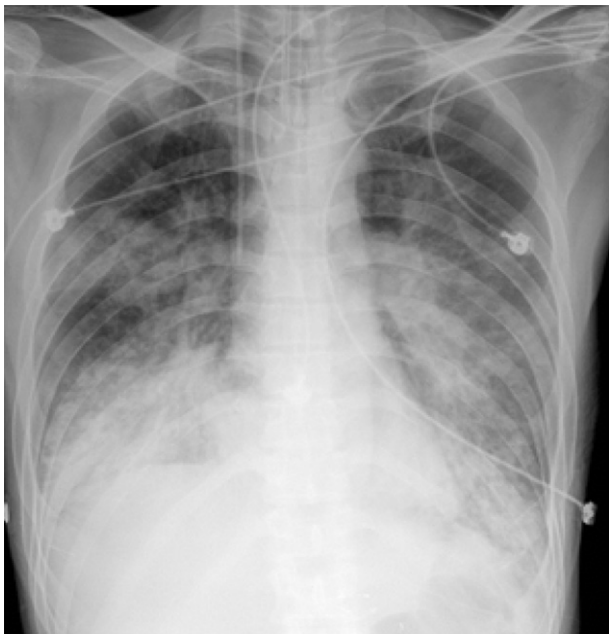

Figure 1. Chest radiograph shows bilateral patchy consolidations of the lung.

Pulsed-field gel electrophoresis typing of *Xba*I-digested genomic DNA materials of two *K pneumoniae* isolates from sputum and blood showed that they belonged to the identical pulsotype.[3] The isolates of *K pneumoniae* were identified as capsular serotype K16 by PCR-restriction fragment-length polymorphism and PCR-sequencing analysis of the capsular polysaccharide synthesis regions, as previously described.[4]

Discussion

Previous studies showed that *S pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus* and group A *Streptococcus* were responsible for most bacterial coinfections during the 2009 and previous influenza pandemics.[2,5,6] Martín-Loeches et al reported that bacterial coinfection developed in 17.5% of 645 patients with pandemic (H1N1) 2009 influenza infection.[7] This is the first reported case of laboratory-confirmed pandemic (H1N1) 2009 influenza virus and serotype K16 *K pneumoniae* coinfection causing severe pneumonia with acute respiratory failure in an immunocompromised patient.

Several host conditions, such as chronic lung disease, immunosuppression and obesity, were identified as risk factors for severe complications of pandemic (H1N1) 2009.[8] In addition, bacterial coinfections were associated with a higher risk of influenza-related morbidity and

mortality.[2,5,6] Underlying cancer and *K pneumoniae* pulmonary coinfection probably contributed to the severity of pandemic (H1N1) 2009 influenza in this patient.

There is no a single rule that can currently predict bacterial infections in patients with pandemic (H1N1) 2009, and therefore it is difficult to determine when to prescribe broad-spectrum antibiotics for patients with influenza. This is an important issue, however, in the midst of this influenza pandemic. If a patient does not receive the appropriate antibiotic early, the risk of mortality is high. On the other hand, the overuse of antibiotics creates selective pressure for antimicrobial-resistant bacteria and increases the risk of antibiotic-associated diarrhea. In this case, poor clinical response to oseltamivir may suggest bacterial coinfection, although such a scenario might be related to an oseltamivir-resistant influenza strain.[8] Therefore, adding antibacterial agents when a patient fails to respond well to oseltamivir treatment appears to be warranted.

In conclusion, physicians should consider the possibility of bacterial coinfections in patients with influenza, especially when their conditions deteriorate with oseltamivir treatment. *K pneumoniae* may be a copathogen in individuals with pandemic (H1N1) 2009.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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