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Severe community-acquired pneumonia due to *Pseudomonas aeruginosa* coinfection in an influenza A(H1N1)pdm09 patient

KEYWORDS
Coinfection;
Influenza A(H1N1) pdm09;
Pseudomonas aeruginosa;
Pneumonia

Abstract Coinfection with *Pseudomonas aeruginosa* in patients with influenza is rare. Herein, we report a 39-year-old female patient who presented with severe community-acquired pneumonia due to coinfection with influenza A(H1N1)pdm09 and *P. aeruginosa*, which progressed to multifocal pneumonia with a fatal outcome.

Dear Editor,

Bacterial coinfection is a major cause of morbidity and mortality in patients with influenza.[1] The two most predominant coinfecting organisms are *Streptococcus pneumoniae* followed by *Staphylococcus aureus*, regardless of whether the infection is seasonal or caused by a novel virus.[2] However, no case report concerning clinical manifestation of influenza and *Pseudomonas aeruginosa* coinfection could be found in the literature. We report a healthy 39-year-old woman who visited the emergency department with dyspnea and a one-week history of fever, cough, and malaise. Initially, her temperature was 36.5 °C, heart rate 111 beats per minute, blood pressure 80/54 mmHg, and respiratory rate 20 breaths per minute, with oxygen saturation of 93% while breathing oxygen at 4 L/min. Laboratory studies revealed a white-cell count of 810/mm^3, with 63.8% neutrophils, 23.1% lymphocytes, and 11.8% monocytes. Rapid influenza antigen test was negative. A chest radiograph revealed patchy infiltrates in both lungs. Intravenous empirical piperacillin/tazobactam at 4500 mg every 8 h and oral oseltamivir at 150 mg twice daily were administered. Chest computed tomography showed patch densities and ground-glass opacity (Fig. 1A). Emergent endotracheal intubation with mechanical ventilation and extracorporeal membrane oxygenation installment were performed due to rapid deterioration of respiratory condition and refractory shock. A gram stain smear of bronchial alveolar lavage showed gram-negative bacilli with a paucity of phagocytes (Fig. 1B). The patient expired 23 h after arrival despite highly intensive care. Polymerase chain reaction analysis of a nasopharyngeal swab sent to the Taiwan Center for Disease Control reported positive for influenza A (H1N1) pdm09. Blood and sputum cultures yielded *P. aeruginosa* 2 days after the patient expired. The Phoenix Automated Microbiology System (Becton Dickinson, Sparks, MD, USA) was used to determine the antimicrobial susceptibility of *P. aeruginosa* isolates, based on Clinical and Laboratory Standards Institute guidelines. The *P. aeruginosa* isolated from the bloodstream was susceptible to imipenem (minimum inhibitory concentration = 2 μg/mL), meropenem (≤1 μg/mL), aztreonam (8 μg/mL), amikacin (≤8 μg/mL), ceftazidime (2 μg/mL), cefepime (≤2 μg/mL), ciprofloxacin (≤0.5 μg/mL), gentamicin (≤2 μg/mL), levofloxacin (≤1 μg/mL), and piperacillin/tazobactam (≤4/4 μg/mL).

A severe and prolonged influenza epidemic in Taiwan was observed in 2015–2016. As of June 30, 2016, there

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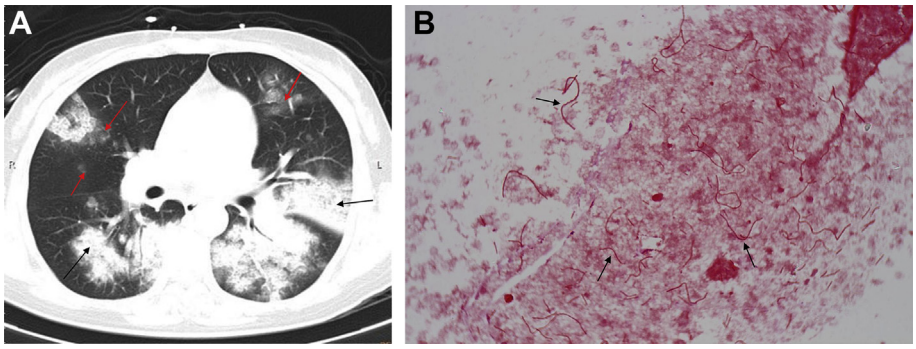

Figure 1. A Chest computed tomography (red arrows-> ground-glass opacity; black arrows: consolidation). B Gram staining of sputum specimen (1000X with oil immersion). A large numbers of varied-size-gram −negative bacilli with a paucity of phagocytes in a gram stain smear of bronchial alveolar lavage.

were 2018 confirmed severe complicated influenza cases, including 163 deaths, the majority of them in individuals infected with influenza A(H1N1)pdm09.[3]

Influenza and *P. aeruginosa* coinfection is rare, and its pathogenesis remains unclear. A mouse model study of influenza and bacterial coinfection determined that type I interferon associated suppression of type 17 immunity and antimicrobial peptide production during influenza increased host susceptibility to coinfection with *P. aeruginosa*.[4] However, a definite relationship has yet to be established.

Our patient expired even though oseltamivir and empirical antibiotics were administered early. For complicated influenza patients, one study suggested a 62% survival rate after peramivir use.[5] Peramivir could be an alternative treatment in acute influenza infection.

Because *P. aeruginosa* is a coinfecting pathogen with influenza A(H1N1)pdm09, clinicians should consider this possibility when patients have influenza-associated pneumonia with severe leukopenia. A timely antiviral agent and appropriate antibiotic use could be lifesaving.

Conflicts of interest

The contributing authors all declare no conflicts of interest.

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