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Case Report

Outbreaks of influenza B infection and pneumococcal pneumonia at a mental health facility in Japan

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ABSTRACT

Background: Japan has an aging population and an increasing number of patients who reside in long-term care and mental health facilities. Both pneumococcal pneumonia and influenza B infection outbreaks have been observed in these populations, although no reports have described concurrent outbreaks of pneumococcal pneumonia and influenza B infection in these facilities.

Case presentation: Six patients and two staffs were initially diagnosed with influenza B infection at a mental health facility on March 14, 2015. By March 21, influenza B infection was diagnosed in 26 patients and 10 staff; all individuals received anti-influenza drugs. On March 19, two patients were diagnosed with pneumococcal pneumonia, and seven patients had developed pneumococcal pneumonia by March 24. Six of these seven patients also had influenza B infection. All individuals who developed pneumococcal pneumonia were hospitalized and treated using ampicillin/sulbactam at our hospital, and their symptoms subsequently subsided. Among the seven pneumococcal strains that were frozen and stored, two strains were type 3 and five strains were type 11A/E. Pulsed-field gel electrophoresis testing revealed that each of the serum types were from the same clone.

Conclusion: It appears that an outbreak of influenza B infection was followed by the spread of multiclone pneumococcal pneumonia among elderly patients at a mental health facility. Therefore, it may be prudent to use vaccinations to prevent the spread of pneumococcal pneumonia among elderly patients and this diagnosis should be actively considered during outbreaks of influenza infection at elder care facilities.

1. Introduction

According to the World Health Statistics, Japan had the longest life expectancy in 2014 (84 years for men and women) [1]. However, the rapid increase in the elderly Japanese population resulted in pneumonia becoming the third leading cause of death (after malignancy and heart disease) in 2011, and further growth is expected. Thus, to address the increasing number of people who are receiving care at home or in nursing homes, the Japanese Respiratory Society issued the Clinical Practice Guidelines for Nursing- and Healthcare-associated Pneumonia (NHCAP) [2]. In this context, *Streptococcus pneumoniae* is the most important pathogen for both community-acquired pneumonia and NHCAP among elderly patients [3]. Furthermore, *S. pneumoniae* was detected in sputum from 31.8% of patients with NHCAP [4], and outbreaks of pneumococcal pneumonia in nursing homes and care facilities have been sporadically reported in the US, Europe, and Japan [5,6].

Morbidity and death are frequently associated with influenza outbreaks among elderly residents of nursing homes and care facilities. Thus, the American Centers for Disease Control and Prevention

Abbreviations: ABPC/SBT, ampicillin/sulbactam; NHCAP, Nursing- and Healthcare-associated Pneumonia; SpO_2, saturation pulse oximeter.

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encourages influenza vaccinations for patients and staff in nursing homes and care facilities as well as immediate antiviral treatment and chemoprophylaxis during outbreaks [7]. Influenza A has generally been considered the primary pathogen for these outbreaks, and influenza B is considered less pathogenic, as it is associated with less severe infections in otherwise healthy adults [8,9].

We recently experienced an outbreak of influenza B infection that was followed by an outbreak of pneumococcal pneumonia at a mental health facility. However, to the best of our knowledge, no reports have described an outbreak of pneumococcal pneumonia that occurred after an outbreak of influenza A or B infection at a nursing home or care facility. Therefore, we report and discuss our experience with the early-stage detection of these outbreaks, the treatment of the pneumococcal pneumonia, and the importance of prophylactic vaccination.

2. Case report

2.1. The influenza B infection outbreak

Six patients and two staffs at a mental health facility developed a high fever and were examined at our institution. The individuals were diagnosed with influenza B infection, and were treated using anti-influenza drugs. Quick-Chaser Flu AB (MizuhoMedi, Tokyo, Japan), which is a kit for diagnosing influenza, was used. However, the outbreak continued, and 26 patients and 10 staffs were diagnosed with influenza B infection by March 21 (Table 1). Every individual visited either our hospital or a clinic, and was diagnosed with influenza B infection using rapid diagnosis kits for influenza. All individuals with influenza B infection were treated using anti-influenza drugs (either oseltamivir or laninamivir). At that time, the facility housed 51 patients, with 44 patients sharing double-occupancy rooms and seven patients living in single-occupancy rooms. Among the patients who shared double-occupancy rooms, seven pairs of patients developed influenza B infection, and eight individuals also developed the infection (including four of the seven patients who lived in single-occupancy rooms). All patients and staff had received an influenza vaccine (Influenza HA vaccine, Denka Seiken, Tokyo, Japan) in November 2014, and prophylactic oseltamivir was administered to patients who did not develop influenza B infection during the outbreak. This case study was approved by the ethical committee of Suzaka Hospital on May 20, 2016.

2.2. The outbreak of pneumococcal pneumonia

2.2.1. Patient 1

This patient was a 72-year-old man with mental retardation. He developed a fever on March 15, 2015, and visited our hospital to receive treatment for symptoms of upper respiratory tract inflammation. Influenza B antigen was detected in his pharynx, and we prescribed oseltamivir to the patient (300 mg/day for 5 days). However, the patient experienced a high fever (39 °C) that continued for several days, and revisited our hospital with inappetence and dyspnea on March 19. His body temperature was 38.8 °C, his SpO_2 was 90%, and we detected coarse crackles in the left lung during auscultation. Laboratory tests revealed a white blood cell count of 3700/μL and C-reactive protein levels of 23.8 mg/dL. Infiltration was observed in the left middle lung field during chest radiography. The urine was positive for the pneumococcal antigen (BinaxNOW streptococcus pneumonia, Aria Medical Co., Chiba, Japan), and a sputum culture revealed penicillin-susceptible *Strepcoccus pneumoniae*. We treated the patient using fluid replacement therapy and (1.5 g of ampicillin/sulbactam (ABPC/SBT), 3 times per day for 6 days), and the patient subsequently recovered and was discharged in good health.

Table 1
Outbreak of influenza B and pneumococcal pneumonia among patients and stuffs.

March	Date of diagnosis		
	Influenza B		Pneumococcal pneumonia
	Patients	Staffs	Patients
14	6	2	
15	4		
16	2	6	
17	3		
18	5		
19	5	1	2
20	1		1
21		1	1
22			1
23			1
24			1
Total	26	10	7

2.2.2. Patient 2

This patient was a 61-year-old man with diabetes, chronic obstructive pulmonary disease, COPD and mental retardation. He visited our hospital with a fever of 37.2 °C that had developed on March 14 and upper respiratory tract inflammation. We did not detect influenza A or B antigens, although we administered prophylactic oseltamivir (150 mg/day) because we were aware of the influenza B outbreak at that facility. The patient continued the oseltamivir treatment for 7 days, although he continued to experience a fever of >37 °C, and revisited our hospital on March 19. The patient presented with a fever of 39.9 °C (which had developed on the same day), cough, purulent sputum, dehydration, a reduced level of consciousness, and an SpO_2 of 80% We detected coarse crackles in the left lung during auscultation. Laboratory tests at the admission revealed a white blood cell count of 6500/μL (Bands: 23%, Segs: 57%), C-reactive protein levels of 20.88 mg/dL, and negative results for the influenza A and B antigens. Infiltration was observed in the left middle lung field during chest radiography. His urine was positive for the pneumococcal antigen, and a sputum culture revealed penicillin-susceptible *S. pneumoniae*. We treated the patient using fluid replacement therapy and antimicrobial agents (1.5 g of ABPC/SBT, 3 times per day for 8 days), and the patient subsequently recovered and was discharged in good health.

Patient 3 to Patient 7 were diagnosed with pneumonia because each patient had a persistent fever (two to five days) after having been infected with Influenza B and infiltration was observed from the patients' chest X-ray. Pneumococcus was identified as the cause because it was isolated in the phlegm test and urinary pneumococcal antigen was positive. Patients were treated with 1.5 g of ABPC/SBT, three times per day for six to eight days.

2.2.3. Patient characteristics

As shown in Table 2, seven patients were diagnosed with pneumococcal pneumonia by March 24 and were hospitalized at our hospital. The average patient age was 70 ± 5 years, and six of the seven patients had been infected with influenza B. There was an average lag of 5.3 ± 1.8 days (range: four to nine days) between the diagnoses of influenza B infection and pneumococcal pneumonia. All patients with pneumococcal pneumonia exhibited infiltration during their chest radiography and penicillin-susceptible *S. pneumoniae* in their sputum cultures (minimum inhibitory concentration for penicillin G: 0.006 μg/mL.). Based on the pulsed-field gel electrophoresis and serum typing results, pneumococcal strains exhibited the same banding patterns (type 3: Patients 1 and 6, and type-11A/E pneumococcus: Patient 2,3,4,5 and 7) (Fig. 1), suggesting the pneumococcal outbreak by the two strains. Six of the seven patients with pneumococcal pneumonia had been living in double-

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