Successful Treatment of a Previously Healthy Woman with *Pseudomonas aeruginosa* Community-acquired Pneumonia with Plasmapheresis

Masashi Okamoto, Junko Yamaoka, Satoshi Chikayama, Tohru Ohishi, Tomoki Nakajima and Toshiaki Nakashima

**Abstract**

A previously healthy 39-year-old woman with severe chest pain presented at our hospital. She was diagnosed with bacterial pneumonia by chest X-ray and computed tomography. Despite adequate antimicrobial treatment, she had to undergo intubation for respiratory distress and was treated with mechanical ventilation 42 hours after admission. However, her condition improved markedly after plasmapheresis. Bacterial culture specimens from the sputum, blood, and pleural fluid were positive for *Pseudomonas aeruginosa* (*P. aeruginosa*). *Pseudomonas aeruginosa* community-acquired pneumonia (CAP) in previously healthy individuals is very rare, rapidly progressive, and often fatal. This is the first report of the successful treatment of this life-threatening pneumonia with plasmapheresis.

**Key words:** *Pseudomonas aeruginosa*, community-acquired pneumonia, plasma exchange, plasmapheresis

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**Introduction**

*Pseudomonas aeruginosa* (*P. aeruginosa*) is well-recognized as a nosocomial pathogen and is widespread in soil, water, and other moist environments (1). It is also an important pathogen that often causes pneumonia in hospitalized patients. The majority of these patients have an underlying medical condition or a risk factor for *Pseudomonas* infection. However, there have been several case reports of previously healthy individuals with community-acquired pneumonia (CAP) caused by *P. aeruginosa* (2, 3, 4-10). Such cases are often rapidly progressive and may be fatal. There is no treatment recommendation except for the immediate use of appropriate antibiotics.

We herein report a case of life-threatening *P. aeruginosa* CAP in a previously healthy 39-year-old woman, who was successfully treated with plasmapheresis.

**Case Report**

A 39-year-old woman with pleuritic chest pain and mild a dry cough visited our clinic and was immediately hospitalized on September 4, 2011. Three days before admission, she had experienced the onset of diarrhea. With the exception of smoking and social drinking, there was no underlying risk factor for infection. An initial physical examination revealed a body temperature of 37.2°C, pulse of 120 beats/min, respiratory rate of 24 breaths/min, and blood pressure of 105/51 mmHg. Her oxygen saturation was 98% in room air. A chest examination revealed no crackles. Laboratory examinations demonstrated an elevated C-reactive protein level (6.61 mg/dL) and a white blood cell count of 21.5×10^9/L with 86% neutrophils. A chest X-ray and computed tomography showed right upper lobe infiltration (Fig. 1). She was therefore diagnosed with bacterial pneumonia. Soon after admission, she was empirically treated with ceftriaxone, but her condition rapidly deteriorated.

She subsequently developed severe chest pain and re-
ported the onset of hemoptysis. Her blood pressure dropped to 64/46 mmHg, and she required oxygen inhalation because of worsening hypoxia. Ten hours after admission, a chest X-ray indicated a rapid increase in pulmonary opacities (Fig. 2). A few gram-negative bacilli and gram-positive cocci were observed in the gram-stain of a sputum smear. The antibiotic treatment was therefore changed to meropenem and ciprofloxacin, and steroid pulse therapy in combination with sivelestat sodium was started. Forty-two hours after admission, she was transferred to the intensive care unit, where she underwent intubation for respiratory distress and thereafter was treated with mechanical ventilation. She also received drainage for right-sided pneumothorax, and a hemorrhagic, purulent pleural effusion was drained from the thoracic cavity. The next day, we started plasmapheresis using fresh frozen plasma, because the rapidly progressive pneumonia and massive hemoptysis indicated the possibility of vasculitis-induced disorders such as Goodpasture’s syndrome, systemic lupus erythematosus or polyarteritis nodosa. After a total of three plasma exchanges, her condition improved markedly. Six days after intubation, she was able to be weaned from mechanical ventilation.

On the fifth day of hospitalization, we finally found that culture specimens from the sputum, pleural fluid, and venous blood were all positive for P. aeruginosa susceptible to ceftriaxone, meropenem, ciprofloxacin, piperacillin, and amikacin. Autoantibodies, including antinuclear antibodies, anti-double strand DNA antibodies, anti-Sm antibodies, anti-neutrophil cytoplasmic antibodies and anti-glomerular basement membrane antibodies were all negative. After this critical period, her condition became favorable enough to allow her to undergo surgical treatment for pneumothorax and pyothorax, and she was then transferred to another hospital (Fig. 3).

Discussion

P. aeruginosa is an aerobic gram-negative bacterium that can be isolated from a broad spectrum of sources in the environment, including water, soil, plants, and animals including humans (3). It survives under minimal nutritional conditions and multiplies even in distilled water. A few types of community-acquired P. aeruginosa infection have been described in the literature, including green nail syndrome, toe-web infection, hot tub-associated folliculitis, whirlpool-associated urinary tract infection, otitis externa, pedal osteomyelitis after puncture wounds, and right-sided endocarditis in injection drug users (11). In contrast, P. aeruginosa CAP is very rare (2, 3, 4-10) and usually occurs in patients with underlying diseases, including malignancy, cystic fibrosis, aplastic anemia, and bronchiectasis (12-14). There are only a few published reports of severe P. aeruginosa infections occurring in previously healthy persons without underlying diseases (2, 3, 4-10). This is the first report of P. aeruginosa CAP in a previously healthy individual in our country.

Hatchette et al. reported the clinical features of P. aeruginosa CAP (2). The report showed that patients tended to be middle-aged (45±15 years), and five of six patients were

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**Figure 1.** Chest X-ray (A) and computed tomography (B) on arrival at the hospital showed pulmonary infiltration localized in the right upper lobe.

**Figure 2.** A chest X-ray taken ten hours after admission indicated a rapid increase in pulmonary opacities.
smokers. Eight of 12 patients complained of pleuritic chest pain. Sputum production was present in more than half of the patients. Of those showing sputum production, 50% had hemoptysis. Two-thirds of the patients demonstrated involvement of the right upper lobe. Six of 11 patients had hypotension. Seventy-five percent required intubation within 48 hours of admission. More than 92% of the patients had bacteremia. The mortality rate was 33%, and death occurred rapidly, with a median time of 11 hours from admission to death. Based on this report, our patient is thought to be a typical case of *P. aeruginosa* CAP.

The route of *P. aeruginosa* infection remains unknown. It has been reported that the disease is associated with exposure to contaminated water aerosols. Rose et al. reported a case of *P. aeruginosa* pneumonia occurring from exposure to contaminated water aerosols in a private home whirlpool (6), and Harris et al. reported a case of *P. aeruginosa* CAP associated with the use of a home humidifier (7). Crnich et al. and Huhulescu et al. reported severe *P. aeruginosa* pneumonia associated with a contaminated hot tub (3, 10). In our case, the patient’s children kept beetles, and she often sprayed water into the rearing cage to increase the soil humidity. She may thus have inhaled contaminated aerosols at that time.

There is no treatment recommendation for this type of CAP except for the immediate use of appropriate antibiotics. The reason we treated her with plasma exchange is that systemic vasculitis could not be ruled out completely. She was thought to be complicated with septic shock because she was developing severe hypotension. Because Busund et al. had reported that plasma exchange is effective in case of severe sepsis and septic shock (15), plasma exchange for our patient was thought to be effective for the prophylaxis of acute respiratory distress syndrome and multiple organ failure. If we had confirmed *P. aeruginosa* CAP complicated with septic shock earlier, we would have used other types of plasmapheresis, such as continuous hemodiafiltration and polymyxin-B immobilized column direct hemoperfusion rather than plasma exchange.

In summary, we herein reported a case of life-threatening *P. aeruginosa* CAP in a previously healthy individual, who was successfully treated with plasma exchange. To our knowledge, this is the first report of *P. aeruginosa* CAP in a previously healthy individual that was successfully treated with plasmapheresis. The findings of this report may therefore be of use when treating similar cases in the future.

The authors state that they have no Conflict of Interest (COI).

References