Rapidly Progressive Pneumonia Due to *Aeromonas hydrophila* Shortly after Near-drowning

Makoto Miyake, Kanji Iga, Chisato Izumi, Aya Miyagawa*, Yoichiro Kobashi* and Takashi Konishi

Abstract

An 87-year-old woman died of rapidly progressive pneumonia due to *Aeromonas hydrophila* shortly after a near-drowning event. Autopsy showed necrotizing pneumonia and postmortem cultures of both blood and lung revealed the organism. Fulminant pneumonia should be considered in patients of a near-drowning event. (Internal Medicine 39: 1128–1130, 2000)

Key words: acute respiratory distress, necrotizing pneumonia, pathology, antibiotic therapy

Introduction

In Japan, approximately 6,000 people die annually from drowning (1). Although cerebral hypoxia directly caused by submersion has been recognized as a major cause of death (2, 3), mortality and morbidity attributable to infections have not been demonstrated. Only a few cases of pneumonia have been reported as a complication of near-drowning, however, pneumonia is one of the most life-threatening infections and its mortality reaches 60% (4). We present a case of fulminant pneumonia caused by *Aeromonas hydrophila* shortly after near-drowning and discuss the importance of prophylactic antibiotic therapy after near-drowning.

Case Report

A previously healthy 87-year-old woman was found lying in a shallow irrigation ditch near her house. Her face was above the water surface when passersby found her. At first she seemed to be unconscious, but she responded to their calls and staggered to her feet. Immediately she was brought to our hospital by ambulance. Her family reported that she had been in usual good health about one hour before she was found and had left her house for a walk.

The patient arrived at our hospital forty minutes after she was found. On arrival the patient was stuporous and in severe respiratory distress. The pulse rate was 120 beats/min, the blood pressure 75/34 mmHg, the respiratory rate 40/min and the temperature 34.0°C. Coarse crackles were remarkable throughout the entire lung field and peripheral cyanosis was noted. A chest X-ray film on arrival demonstrated diffuse bilateral alveolar infiltrates (Fig. 1). Arterial blood gas analysis while breathing room air was as follows: pH 7.23; PaO$_2$ 39.7 mmHg; PaCO$_2$ 47.6 mmHg. The white blood cell count was 1,100 per cubic millimeter with a marked shift to the left (28.0% of band cells). C-reactive protein was less than 0.2 mg/dl.

The patient received initial treatments of ceftazidime, volume expansion, vasopressors, glucocorticoid, and oxygen soon after admission. Two hours after admission, the patient coughed up about 500 ml of bright red blood and entered severe shock. Despite intensive support effort, the patient died nine hours after admission.

Autopsy was performed five hours after death. The lungs were firm and heavy; the left lung weighed 500 g and the right, 810 g. Forty ml of unclotted blood was present in the right pleural cavity and there was no fluid in the left. Both lungs were histologically similar. The alveoli were filled with hemorrhagic and proteinaceous fluid, and the most striking finding was necrosis of alveolar walls. Numerous small gram-negative rods were seen with sparse inflammatory cells, especially in the areas of severe necrosis (Fig. 2). Other organs were normal at the examination.

A culture of blood obtained at the emergency room was negative for pathogens, but postmortem cultures of lung and of blood revealed *Aeromonas hydrophila*. An aspirated specimen of inferior lobe of left lung was inoculated on sheep blood agar, BTB lactose agar and brucella HK agar. The former two plates were incubated aerobically at 35°C for 24 hours and the latter plate was incubated anaerobically with a Gas Pak jar at 35°C for 48 hours. Blood aspirated from the heart was incubated with the BACTEC automated blood culture system (Becton Dickinson, Sparks, Maryland, USA) and both aerobic and anaerobic culture bottles showed turbidity after 24 hours of incubation. All postmortem cultures of lung and blood yielded colonies of a facultative anaerobic gram-negative bacillus and there were no other organisms recovered. These isolates were identified as *Aeromonas hydrophila* (Biotype: 61000313) and...
Fulminant Pneumonia after Near-Drowning

Antimicrobial susceptibility test of this organism was performed by the MicroScan WalkAway system (Dade Behring, West Sacramento, California, USA) in conjunction with the MicroScan Combo Negative type 4J panel. The minimal inhibitory concentrations (MICs) of various antibiotics were as follows: ofloxacin, <0.5 μg/ml; gentamicin, <1 μg/ml; minocyclin, <1 μg/ml; aztreonam, <2 μg/ml; ceftazidime, <2 μg/ml; isepamicin, 4 μg/ml; cefoperazone, <8 μg/ml; amikacin, 8 μg/ml; imipenem, >8 μg/ml; cefazolin, >16 μg/ml; piperacillin, >64 μg/ml.

Discussion

In this case, fulminant pneumonia due to Aeromonas hydrophila developed in a healthy elderly woman shortly after near-drowning and showed an extremely rapid fatal clinical course. Hypoxia-induced organ damage due to pulmonary edema caused by aspiration of water has been recognized as a major cause of death in near-drowning victims (2, 3, 5), however, the course is sometimes complicated by severe infection associated with the submersion event. In particular, pneumonia is one of the most devastating infectious complications and its mortality is very high (4).
The causative organisms of pneumonia after near-drowning are varied. Some organisms, particularly the gram-negative bacilli such as Aeromonas hydrophila, Chromobacterium violaceum, Burkholderia pseudomallei, and Francisella novicida, are frequently isolated from the blood. Of these organisms, A. hydrophila is the most frequently reported bacillus to cause pneumonia after near-drowning and this type of pneumonia is the most serious (4).

A. hydrophila is a facultative anaerobic gram-negative bacillus that is ubiquitous and commonly found in both freshwater and saltwater (4, 6, 7). It has been regarded as an opportunistic agent that causes sepsis, soft tissue infection, and gastrointestinal enteritis in immunologically compromised hosts (7). Recently, pneumonia due to this organism has been reported to develop even in healthy immunocompetent people and 16 cases of pneumonia have been described in the English literature (8–14); seven cases were associated with near-drowning and the details were available in five cases (9–12). Pneumonia developed in previously healthy young men in four of the five cases, while the other patient had liver cirrhosis. Four patients were initially without evidence of infection, however, pneumonia developed within 24 hours to 72 hours of the submersion event. In the other case, pneumonia developed very shortly after the event. One patient recovered, another died on the 12th day of hospitalization, and the others died within 72 hours after admission. The antimicrobial susceptibility test was described in three cases (9, 11) and all of these A. hydrophila isolates were sensitive to gentamicin as the present case, but resistant to ampicillin in two cases and showed a varied response to cephalosporins. While the susceptibility of Aeromonas varies according to species, most Aeromonas spp. are resistant to penicillin, ampicillin, carbenicillin, erythromycin and clindamycin but sensitive to aminoglycosides except for streptomycin, chloramphenicol, tetracycline, co-trimoxazole, fluoroquinolones and third generation cephalosporins (15). Therefore, administration of these antimicrobial agents is recommended for A. hydrophila infections.

Hypoxia-induced organ damage due to pulmonary edema has been reported to be a major cause of death in near-drowning victims. If autopsy had not been performed in this case, we also would have certainly made a diagnosis of pulmonary edema due to aspiration because such a rapidly progressive clinical course had seemed to contradict a diagnosis of an infectious disease. However, histological examination revealed that there was severe necrotizing pneumonia in addition to pulmonary edema. This extensive parenchymal necrosis throughout both lungs and numerous small gram-negative rods with a slight inflammatory cellular reaction were suggestive of the virulence of this pathogen and could explain the rapid clinical course. A. hydrophila is known to produce cytoxin and hemolysin, although the roles of these factors in the pathogenesis of infection are unclear (16, 17). We speculate that these factors play an important role in the development of tissue damage in infection and in our case they caused direct destruction of the lung parenchyma before the influx of inflammatory cells.

The extreme rapidity of the clinical course and high fatality rate of pneumonia after near-drowning deserve emphasis. Fulminant pneumonia should be considered in all victims of near-drowning, and it is recommended that antibiotic therapy, including an aminoglycoside, a fluoroquinolone, a tetracycline, or a third generation cephalosporin, be started as early as possible in the setting of critical illness or clinical suspicion of infection.

References