

Fatal bacteremic pneumonia caused by *Aeromonas hydrophila* in a previously healthy child

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Received: February 4, 2002 Revised: July 8, 2002 Accepted: August 7, 2002

Aeromonas hydrophila sepsis and pneumonia are rare diseases in children that carry a high mortality rate. We report a case of fatal bacteremic pneumonia caused by *A. hydrophila* in a previously healthy 5-year-old child. The source of infection was not determined and the child died within 4 hours of admission. In children who develop a fulminant disease of pneumonia with or without sepsis, particularly those who have underlying medical conditions, a possible *A. hydrophila* infection, though rare, should be considered. More reported cases are needed to establish the epidemiologic features of this disease in children.

Key words: *Aeromonas hydrophila*, children, pneumonia, sepsis

Aeromonas hydrophila is a facultative anaerobic, gram-negative bacillus. It is found in non-fecal sewage, and can be isolated from tap water, canals, streams, and rivers. It is a pathogen in cold-blooded animals, including fish, amphibians, and reptiles. In general, it is considered an opportunistic pathogen for humans; however, this organism has increasingly been identified as a primary pathogen in normal individuals as well as in immunocompromised patients [1].

In children, *A. hydrophila* has been implicated as a cause of septicemia, gastroenteritis, peritonitis, skin and wound infections, septic arthritis, osteomyelitis, ocular infections, myositis, urinary tract infections, pneumonia, meningitis, and hemolytic uremic syndrome [2]. Most of these infections have been reported in both normal and immunocompromised hosts. Among these disease manifestations, pneumonia is rare. We report a case of *A. hydrophila* bacteremic pneumonia in a previously healthy 5-year-old girl. She contracted *A. hydrophila* from an unknown source, and died within 4 hours of admission.

Case Report

A previously healthy 5-year-old girl presented with high fever, cough, vomiting, poor activity, poor appetite, and blood-tinged sputum for 1 day. She was sent to Chang Gung Children's Hospital. According to the parents, the girl has neither swum in a river nor had an airway

aspiration recently. Physical examination in the pediatric emergency department revealed progressive dyspnea and lethargic consciousness. In view of a possible impending septic shock, she was immediately admitted to the pediatric intensive care unit. Vital signs at admission were body temperature 38.8°C, pulse rate 196/min, respiratory rate 68/min, and blood pressure 105/67 mm Hg. There was no skin injury. Chest roentgenographic examination revealed massively increased infiltration and pleural effusion over the right lung (Fig. 1). Laboratory examinations showed hemoglobin 12.4 g/dL, hematocrit 34.3%, and white blood cell count 1200 /mm³. The differential count was 3% meta-myelocytes, 8% band-form neutrophils, 21% neutrophils, 40% lymphocytes, 14% monocytes, and 14% atypical lymphocytes. The platelet count was 194 000 cells/mm³. The C-reactive protein (CRP) value was 325.3 mg/L (normal range, <5 mg/L). The blood urea nitrogen level was 28 mg/dL (normal range, <20 mg/dL). The aspartate aminotransferase level was 55 U/L (normal range, <40 U/L). Coagulopathy was noted with both a prothrombin time and a partial thrombin time of more than 100 seconds. Vancomycin and ceftazidime were administered empirically.

After admission, hemodynamics deteriorated rapidly. Blood pressure had dropped to 77/52 mm Hg 30 min after admission. Dyspnea progressed, and massive bleeding from the nose and mouth was noted. Arterial blood gas showed pH 7.161, pCO₂ 52.5 mm Hg, pO₂ 28.7 mmHg, HCO₃ 18.7 mmol/L, and base excess -10.3 mmol/L. Inotropic agents and intravenous fluid therapy were administered. An endotracheal tube was inserted, and mechanical ventilation was started.

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Fig. 1. Chest x-ray on admission revealed massively increased infiltrates and pleural effusion over the right lung.

However, profound shock persisted despite intensive medical management, and she died 4 hours after admission.

All cultures from the bloodstream, endotracheal aspirate, and postmortem pleural effusion yielded *A. hydrophila*, and all these strains showed the same antibiotic susceptibility pattern of sensitivity to gentamicin, cefamandole, ceftazidime, cefepime, and resistance to ampicillin and cephalothin.

Discussion

A. hydrophila has become an increasingly important pathogen for human in the past 3 decades [3]. Infections caused by this organism in children are far less common than that in adults.

Sepsis and pneumonia caused by *A. hydrophila* are uncommon but severe infections in children. Although *A. hydrophila* sepsis can occur in normal children, most of the affected are immunocompromised patients. Sirinavin *et al* [4] reported that 18 of 20 patients with *A. hydrophila* sepsis had had a known disorder that impaired the normal host response to infection, such as leukemia (especially with neutropenia), aplastic anemia, cirrhosis, hemoglobinopathies, malnutrition, and renal failure. Hong *et al* [5] reported that out of 9 patients

with *A. hydrophila* septicemia, 6 had acute leukemia and were receiving immunosuppressive chemotherapy and 5 of them had profound neutropenia. The clinical manifestations of *A. hydrophila* sepsis are difficult to distinguish from those of other gram-negative enteric blood stream infections manifesting with high fever and shock, as in the present case. The case fatality rate for *A. hydrophila* sepsis is high, at approximately 50% [4]. To our knowledge, pneumonia caused by *A. hydrophila* is rare in children, with a total of 6 reported cases can be found in the literature (Table 1) [4-6]. All of them had concomitant septicemia and one had meningitis. Of these 6 patients, 4 had accompanying medical conditions, including acute leukemia (2 patients), cavernous hemangioma with thrombocytopenia (1) and nephrotic syndrome (1), and one was a victim of near-drowning. Three of them died of fulminant disease.

Infection with *Aeromonas* occurs infrequently and data from controlled studies for the development of antibiotic use recommendations are not available. The harboring of a conjugative plasmid that confers multidrug resistance has been identified. *A. hydrophila* is susceptible to trimethoprim-sulfamethoxazole, fluoroquinolones, chloramphenicol, and aminoglycosides except streptomycin. The organism is resistant to ampicillin and ticarcillin but often susceptible to aztreonam, carbapenems, and third-generation cephalosporins. In clinical practice, a drug to which the organism is susceptible should be provided. The duration of administration of antibiotics depends on the site of infection and the clinical response to therapy. However, because *Aeromonas* infections occur predominantly in compromised hosts, the fatality rate remains high despite therapy with an antibiotic agent to which the organism is susceptible [1].

Knowledge of the epidemiologic and clinical features of *A. hydrophila* pneumonia is almost all based on data from adult patients. Our review identified 15 previously reported cases of adult patients with *A. hydrophila* pneumonia [6-10]. In these cases, the disease was either community- or nosocomially-acquired, and there was a preponderance of males. The infection developed in immunocompromised as well as immunocompetent hosts. Eleven (73%) of these 15 patients had preexisting medical conditions including alcohol abuse (20%), neurologic diseases (including cerebrovascular diseases and/or spinal cord injury) (20%), cardiovascular diseases (27%), chronic obstructive lung disease (20%), chronic renal failure (7%), traffic accidents (7%), and malignancy (7%). Aspiration was considered an important predisposing factor and is implicated in 8 (53%) of these 15 patients.

Table 1. *Aeromonas hydrophila* pneumonia in children reported in the literature

Reference	Age (yr)/sex	Underlying condition	Infected site	Radiological finding of chest	Therapy	Outcome
Present case	5/F		Blood, endotracheal aspirate	Infiltrate and pleural effusion over right lung	Ceftazidime, vancomycin	Died
Sirinavin S, et al [4]	8/M	Acute leukemia			Penicillin, gentamicin	Died
	1/12/M	Cavernous hemangioma with thrombocytopenia			Methicillin	Died
	1/6/M	None			Chloramphenicol, gentamicin	Cured
Hong JY, et al [5]	15/M	Acute myeloblastic leukemia		Cellulitis, myositis, arthritis, pneumonia, ecthyma		Died
	12/M	Nephrotic syndrome		gangrenosum Pleural effusion,		Cured
Reines HD, et al [6]	3/M	Near-drowning with aspiration		conjunctiva Blood, endotracheal aspirate	Penicillin, gentamicin	Cured

Patients with *A. hydrophila* pneumonia often had an extremely rapid disease course with a high case fatality rate (60%). Among the 9 patients who died, at least 6 died within 48 to 72 h after admission despite aggressive medical treatment.

Bacteremic pneumonia caused by *A. hydrophila*, as in this case, is extremely rare in children. In this patient, the portal of entry of this organism could not be determined. In addition, bone marrow examination was not performed in the postmortem examination so that leukemia or other underlying malignancy could not be excluded. Further, immune status was not assessed, so it remains unclear whether the fulminant disease was a manifestation of a primary or secondary immunodeficiency. However, previous medical history revealed no symptoms or signs indicating that she might be immunodeficient.

Although *A. hydrophila* is a rare cause of community-acquired pneumonia in children, it does occur occasionally, as in this case. Experiences on this disease are limited in the pediatric fields. More reported cases are needed to establish its epidemiologic features in children.

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