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Case Report

Rapid progression of severe skin and soft tissue infection with Aeromonas

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Abstract: Aeromonas are widely distributed in air, soil and human intestinal tract, seldom causing serious human infections. Recently, our department admitted a patient with severe skin and soft tissue infections caused by Aeromonas after laparoscopic cholecystectomy, who died within 24 hours in SICU. This case indicates that despite of an opportunistic pathogen with low morbidity, Aeromonas are highly pathogenic and may lead to serious consequences. In clinical practice, we should improve our understanding of Aeromonas.

Keywords: Aeromonas, infection, clinical manifestations, treatment

Introduction

Aeromonas hydrophila are Gram-negative, rod shaped, facultative anaerobic, noncapsulated, asporous bacteria of the family of *Vibrionaceae*. They are widely distributed in aquatic environment and soil, being the primary pathogenic bacteria of many aquatic animals. As an opportunistic human bacterial pathogen, Aeromonas hydrophila are typical pathogenic bacteria of coexisting diseases of human, animal and fish. Aeromonas have a variety of strains, producing many kinds of pathogenic toxins, which may cause acute gastroenteritis and infection of trauma, ranging from local ulcer to cellulitis, septicemia and other systemic infection [1-3]. Because of the low incidence of Aeromonas infection, clinicians pay little attention to this pathogen. Here we would like to report a case of Aeromonas infection.

Case report

A 78-year-old woman was admitted due to "cholelithiasis, chronic cholecystitis". This patient had been diagnosed with cholelithiasis 60 years ago, with recurrent biliary tract infection. One month before admission, she subjected to ERCP, breaking and removing gallstones and nasobiliary drainage due to multiple common bile duct stones with infection. This patient subjected to laparoscopic cholecystectomy on October 2, 2016. Liver and kidney function and blood coagulation were normal before surgery. The surgery was successful with 100 ml of hemorrhage. She received prophylactic cefazolin during and after surgery. At 29 hours after surgery, the patient developed upper abdominal pain, nausea and vomiting. Ecchymosis was observed on the upper abdominal wall, with increased skin temperature and obvious tenderness. Symptomatic treatment did not alleviate the pain, the patient developed shock and the abdominal ecchymosis increased rapidly at 32 hours after surgery. The ecchymosis was like an apron around half belly in a bulging shape, most severe in the left waist. No crepitus was appreciated. In order to exclude abdominal bleeding or infection, exploratory laparotomy was performed. No intra-abdominal hemorrhage, bile leakage, infectious peritoneal exudate or other symptoms were observed. Obvious edema and slight bloody exudate was observed on the abdominal wall. Subcutaneous fat layer appeared purple and necrotic. A small amount of subcutaneous fascia exudate was isolated for bacterial smear and culture. The patient was transferred to our Surgical Intensive Care Unit (SICU) at 6 hours after appearance of abdominal ecchymosis (**Figure 1**). Large doses

Figure 1. A Long ecchymosis in abdominal wall after surgery (The purple abdominal ecchymosis was from the xiphoid to navel. The skin was edematous with high tension and no crepitus was appreciated).

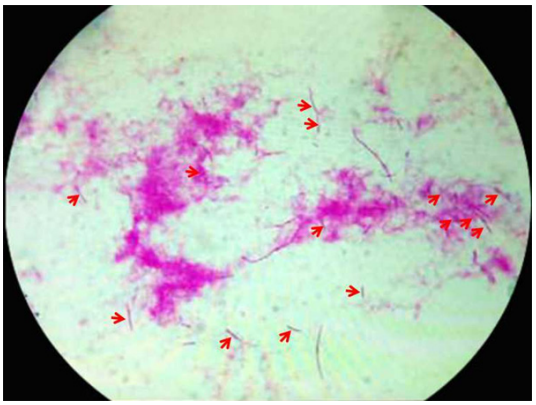

Figure 2. Aeromonas (Gram-negative rod-shaped bacteria under the microscope is Aeromonas). (Original magnification ×1000).

of vasopressors were applied to maintain blood pressure during shock stage. The purple abdominal ecchymosis continued to expand, from the xiphoid to navel. The skin was edematous with high tension and no crepitus was appreciated. During surgery, bacterial smears of the intraoperative abdominal tissue reported Aeromonas hydrophila (**Figure 2**). Meropenem 1.0 g q12h was immediately prescribed for anti-infection. At 17 hours after appearance of abdominal ecchymosis, the ecchymosis expanded to the perineum and upper thigh. The skin became gangrene-like, and local epidermis was detached and blood blister-like (**Figure 3**). At 21 hours after appearance of abdominal ecchymosis, the ecchymosis expanded to her whole body. Due to Aeromonas bacterial infection, the patient finally developed multiple organ failure and was declared clinically dead.

Figure 3. A large area of ecchymosis with blood bubble in abdominal wall (Abdominal wall can be seen a large area of ecchymosis with blood bubble. At 17 hours after appearance of abdominal ecchymosis, the ecchymosis expanded to the perineum and upper thigh. The skin became gangrene-like and local epidermis was detached and blood blister-like).

Laboratory values of this patient were as follows:

Changes of WBC (white blood cells), RBC (red blood cells), PLT (platelets) and PCT (Procalcitonin) are shown in **Figures 4** and **5**.

DIC before death: PT (Prothrombintime) 49.10 s, INR (International Normalized Ratio) 2.71, APTT (Activated Partial Thromboplastin Time)> 60 s, Fg (fibrinogen) 0.34 g/L; Renal function: Cre (Creatinine) 694 μmol/L; Liver function: ALT (Alanine Transaminase) 917 U/L, AST (Aspartate Transaminase) 1084 U/L, TBIL (Total Bilirubin) 326.4 μmol/L, DBIL (Direct Bilirubin) 211.6 μmol/L.

Histology: subcutaneous gas, necrotic tissue and distribution of a large number of neutrophils (**Figure 6**).

Discussion

Aeromonas are widely distributed in water and soil and divided into many species. There are three common motile Aeromonas strain pathogens related to humans: A. hydrophila, A. sobria and A. caviae. Aeromonas can survive in aquatic animals [3, 5], such as fish and shellfish. They can also be found in normal human intes-

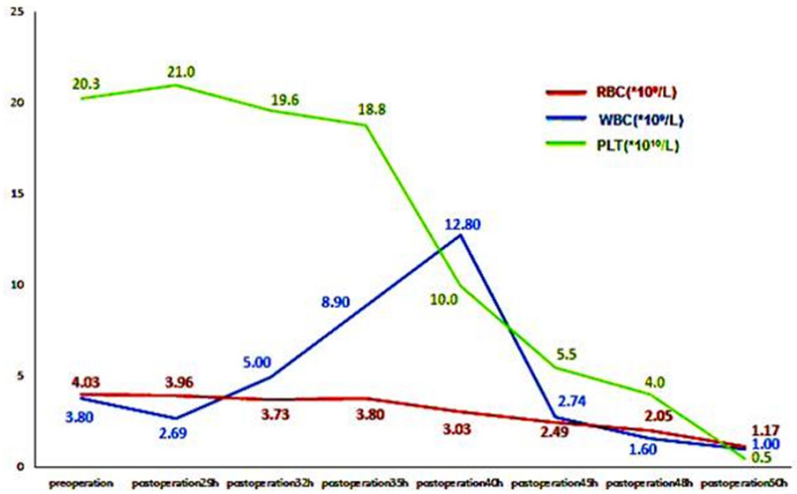

Figure 4. Trends of RBC, WBC, PLT (WBC was lower than normal before surgery, and quickly rose before post-operation 40 hours, rapidly declined after post-operation 40 hours. At the same time, the number of RBC and PLT was persistent declined).

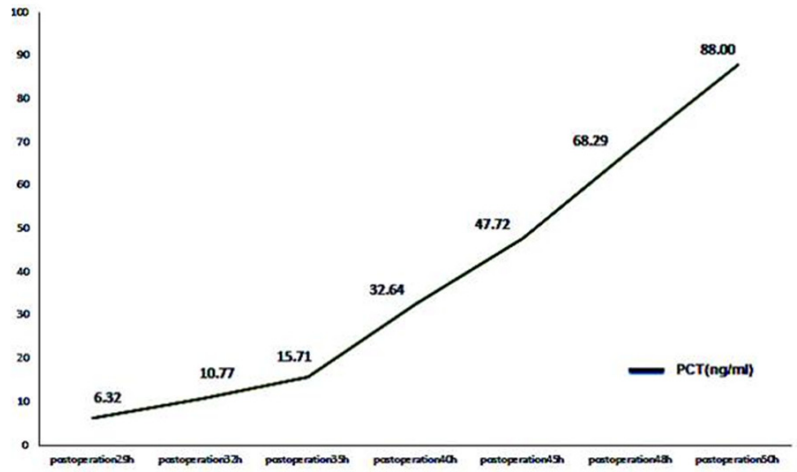

Figure 5. Trends of PCT (PCT was persistent went up).

tinal tract and hepatobiliary system [4]. They are currently considered to be one of the opportunistic pathogens [1-3], and their main toxins are: hemolysin, endotoxin, necrotoxin, enterotoxin and protease [3]. This paper discusses the susceptible population of Aeromonas, clinical manifestations after infection, and diagnosis and treatment of Aeromonas infection.

Susceptible population

(1) Hepatobiliary disease history: Because Aeromonas may be present in human hepatobiliary and intestinal system, Aeromonas infection was mainly reported in patients with hepatobiliary diseases. An epidemiological survey found that Aeromonas infection of the biliary tract accounted for 2.9% of all cholangitis, and causes of such cholangitis are often related to cholelithiasis (or choledocholithiasis), bile duct cancer, pancreatic cancer or benign biliary stenosis [8]. Surgery accounts for 21% of hepatobiliary and pancreatic infection caused by Aeromonas. In our report, the patient suffered from gallbladder and common bile duct stones over a long period of time with recurrent cholangitis. Before paroxysm of cholangitis this time, the patient subjected to two traumatic surgeries-ERCP and cholecystectomy [9], which were the disease factors of Aeromonas infection.

(2) Hypoimmunity: Aeromonas infections were reported in cancers such as leukemia [10] and diabetes [11].

(3) History of exposure to contaminated water or marine product: It was reported that two teenagers suffered from skin impetigo after playing in an unpurified swimming pool [12].

(4) Skin barrier damage: such as burn patients may infect Aeromonas bacteremia [13].

Clinical manifestations

(1) Skin and soft tissue symptoms: ① erythra, herpes and blisters [12, 14]; ② necrotizing fasciitis [15, 16]: this kind of necrotizing fasciitis has similar progress rate and different aerogenesis with Clostridium, which not only destroys the skin but also infects subcutaneous tissue.

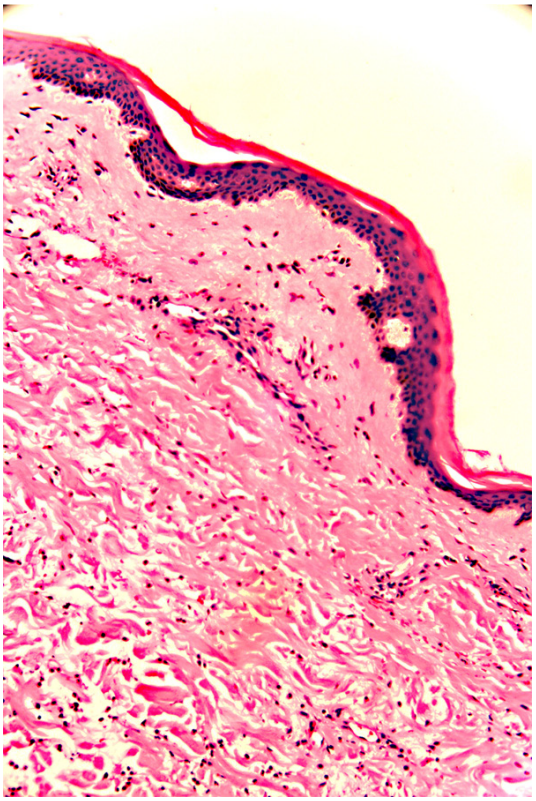

Figure 6. HE staining of abdominal wall tissue slices (There is a large number of subcutaneous gas, necrotic tissue and neutrophils in abdominal wall subcutaneous). (Original magnification ×40).

(2) Pneumonia [17, 18]: Nagata K. et al [17] reported that a 75-year-old female patient, who had a surgery of colon cancer two weeks ago, died at 6 hours after admission The autopsy found that she had severe pneumonia and her alveolar wall and the inside of blood vessels were filled with a large number of Gram-negative short bacillus-Aeromonas and necrotic tissue.

(3) Diarrhea, gastroenteritis: Some parts of India have a high incidence of A. caviae which can cause acute diarrhea and gastroenteritis, with a high infection rate of 13% [19].

(4) Hemolytic uremic syndrome: It is a multi-system involved disease characterized by hemolytic anemia, acute kidney failure, and thrombocytopenia. It predominantly affects children less than 10 years of age [20]. But Aeromonas were also reported to cause hemolytic uremic syndrome in adult [21].

(5) High fever [11].

Diagnosis

(1) the presence of predisposing factors: As mentioned above; (2) Clinical manifestations: the presence of one or more clinical manifestations as mentioned above; (3) laboratory tests [3]: Aeromonas infection indicated by sputum culture, secretions or blood culture, tissue slice, bacteriological examinations or detection of PCR gene.

Treatment

(1) Broad-spectrum antibiotics: Aeromonas are sensitive to many antibiotics, but they also generated resistance with the overuse of antibiotics in recent years, most commonly resistant to first-generation and second-generation cephalosporins. It has been reported that Aeromonas generated resistance to third-generation cephalosporin, even resistant to carbapenems [22]. This phenomenon is especially prominent in China. A variety of drug-resistant strains were found in random shellfish samples [22]. This suggests that we should be careful when empirically using antibiotics. Application of aztreonam, fluoroquinolones and imipenem was suggested [1].

(2) Surgical treatment: Although some literatures recommended early surgical debridement, but these were mainly infection and necrosis of the limbs. Kao and Cui reported cases of Aeromonas infection of limbs, respectively, pointing out that surgical incision and debridement are still the preferred treatment method of necrotizing fasciitis caused by Aeromonas and the time of surgery should be strictly controlled, the sooner the better [15, 16]. Cleaning necrotic tissue timely can improve prognosis and reduce mortality [1].

Lessons learned from this case

1. This patient was susceptible to Aeromonas and the lower level of her white blood cells before surgery indicated the possibility of low immunity. However, this condition did not attract enough attention before surgery.

2. The clinical manifestations of this case were characterized by quickly progressed ecchymosis and necrosis of skin and soft tissue, refractory shock and MODS. Due to lack of awareness of Aeromonas infection, the first consider-

ations in the early time of ecchymosis were: (1) Postoperative intraperitoneal and wound bleeding; (2) Biliary fistula and septic shock caused by bile duct damage; (3) Gas gangrene. After exclusion of the above diseases through exploratory laparotomy and diagnosis of Aeromonas through bacteriological examination, the opportunity of early application of effective antibiotics has been missed.

3. Although surgical debridement or amputation may be considered for Aeromonas infection of limbs, surgical debridement was not feasible for this case because of infection of abdominal tissue. Therefore, early and reasonable application of antibiotics became especially important. The latest guidelines for management of sepsis especially point out that prognosis of patients is associated with the application time of antibiotics, which should be used within 1 hour after shock. The delayed bacteriological diagnosis of this patient resulted in miss of the early use of carbapenem antibiotics.

Conclusion

Aeromonas are opportunistic pathogens, but clinical manifestations may be very serious once infected. Firstly, clinicians should have a comprehensive understanding of Aeromonas. Secondly, once Aeromonas infection is speculated, appropriate antibiotics should be immediately used and necrotic tissue should be timely removed if possible.

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Disclosure of conflict of interest

None.

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References

[1] Lai CC, Shiao CC, Lu GD, Ding LW. Aeromonas hydrophila and Aeromonas sobria bacteremia: rare pathogens of infection in a burn patient. Burns 2007; 33: 255-257.

[2] Gracey M, Burke V and Robinson J. Aeromonas-associated gastroenteritis. Lancet 1982; 320: 1304-1306.

[3] Janda JM and Abbott SL. The genus Aeromonas: taxonomy, pathogenicity, and infection. Clin Microbiol Rev 2010; 23: 35-73.

[4] Wu CJ, Wu JJ, Yan JJ, Lee HC, Lee NY, Chang CM, Shih HI, Wu HM, Wang LR, Ko WC. Clinical significance and distribution of putative virulence markers of 116 consecutive clinical Aeromonas isolates in southern Taiwan. J Infect 2007; 54: 151-8.

[5] Dwivedi M, Mishra A, Prasad A, Azim A, Singh RK, Baronia AK, Prasad KN, Dwivedi UN. Aeromonas caviae septicemia in immunocompetent gastrointestinal carriers. Braz J Infect Dis 2008; 12: 547-548.

[6] Liakopoulos V, Arampatzis S, Kourti P, Tsolkas T, Zarogiannis S, Eleftheriadis T, Giannopoulou M, Stefanidis I. Aeromonas hydrophila as a causative organism in peritoneal dialysis-related peritonitis: case report and review of the literature. Clin Nephrol 2011; 75 Suppl 1: S65-S68.

[7] Wu CJ, Tsai PJ, Chen PL, Wu IC, Lin YT, Chen YH, Wang LR, Ko WC. Aeromonas aquariorum septicemia and enterocolitis in a cirrhotic patient. Diagn Microbiol Infect Dis 2012; 74: 406-408.

[8] Clark NM and Chenoweth CE. Aeromonas infection of the hepatobiliary system: report of 15 cases and review of the literature. Clin Infect Dis 2003; 37: 506-513.

[9] Kuo CH, Changchien CS, Yang CY, Sheen IS, Liaw YF. Bacteremia in patients with cirrhosis of the liver. Liver 1991; 11: 334-339.

[10] Martino R, Santamaria A, Pericas R, Sureda A, Brunet S. Acute rhabdomyolysis and myonecrosis complicating aeromonas bactermia in neutropenic patients with hematologic malignancies: report of two cases. Haematologica 1997; 82: 692-694.

[11] Avolio M, La Spisa C, Moscariello F, De Rosa R, Camporese A. Aeromonas hydrophila ecthyma gangrenosum without bacteraemia in a diabetic man: the first case report in Italy. Infez Med 2009; 3: 184-187.

[12] Julià Manresa M, Vicente Villa A, Gené Giralt A, González-Enseñat MA. Aeromonas hydrophila

folliculitis associated with an inflatable swimming pool: mimicking pseudomonas aeruginosa infection. Pediatr Dermatol 2009; 26: 601-603.
[13] Yasti AC, Otan E, Doganay M, Kama NA. Aeromonas hydrophila in a burn patient. J Burn Care Res 2009; 30: 898-900.
[14] García-Lozano T, Aznar Oroval E, Cruz Mojarrieta J, Messeguer Badía F. Vesiculobullous lesions in an immunocompromised cancer patient. Rev Argent Microbiol 2012; 44: 61.
[15] Kao TL, Kao ML. A fatal case of necrotizing Aeromonasschubertii fasciitis after penetrating injury. Am J Emerg Med 2012; 30: e3-e5.
[16] Cui H, Hao S, Arous E. A distinct cause of necrotizing fasciitis: Aeromonas veronii biovar sobria. Surg Infect 2007; 8: 523-528.
[17] Nagata K, Takeshima Y, Tomii K, Imai Y. Fulminant fatal bacteremic pneumonia due to Aeromonas hydrophila in a non-immunocompromised woman. Intern Med 2011; 50: 63-65.
[18] Issa N and Napolitano LM. Aeromonas pneumonia in a trauma patient requiring extracorporeal membrane oxygenation for severe acute respiratory distress syndrome: case report and literature review. Surg Infect 2011; 12: 241-245.
[19] Dwivedi M, Mishra A, Prasad A, Azim A, Singh RK, Baronia AK, Prasad KN, Dwivedi UN. Aeromonas caviae septicemia in immunocompetent gastrointestinal carriers. Braz J Infect Dis 2008; 12: 547-548.
[20] Kanno Y, Kobayashi H, Rai T, Kanno K, Watanabe K, Obara K, Sato Y. Hemolytic uremic syndrome associated with Shiga toxin producing Escherichia coli infection in a healthy adult woman. Intern Med 2004; 43: 620-623.
[21] Figueras MJ, Aldea MJ, Fernández N, Aspíroz C, Alperi A, Guarro J. Aeromonas hemolytic uremic syndrome. A case and a review of the literature. Diagn Microbiol Infect Dis 2007; 58: 231-234.
[22] Xu JY, Xu GZ, Jin CG. Analysis of drug resistance of pathogenetic Aeromonas in the shell seafood. China Preventive Medicine 2007; 8: 513-515.
[23] Dellinger RP, Levy MM, Rhodes A, Annane D, Gerlach H, Opal SM, Sevransky JE, Sprung CL, Douglas IS, Jaeschke R, Osborn TM, Nunnally ME, Townsend SR, Reinhart K, Kleinpell RM, Angus DC, Deutschman CS, Machado FR, Rubenfeld GD, Webb SA, Beale RJ, Vincent JL, Moreno R; Surviving Sepsis Campaign Guidelines Committee including The Pediatric Subgroup. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med 2013; 41: 580-637.