Case Report

Fatal spontaneous *Aeromonas hydrophila* myonecrosis and sepsis without antecedent trauma

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**Introduction:** *Aeromonas hydrophila* is implicated in a wide spectrum of skin and soft-tissue infections, ranging from cellulitis to life-threatening necrotizing fasciitis and myonecrosis. Most reported cases of fulminant *A. hydrophila* necrotizing soft-tissue infections occur following a history of trauma sustained in an aquatic environment. However, fatal *Aeromonas* myonecrosis and gas gangrene without antecedent trauma, underlying liver disease, malignancy or immunosuppression has rarely been reported in the literature.

**Case presentation:** A 50-year-old woman who underwent elective percutaneous transluminal coronary angioplasty became acutely ill with septic shock and adult respiratory distress syndrome, on post-operative day 3. She developed severe oedema, blistering and gangrenous patches in the right lower limb. She died on post-operative day 3 despite intensive care. *A. hydrophila* was cultured from the blister fluid, two blood cultures and tissue. An inspection of the hospital water supply was negative for *A. hydrophila*, and hence the origin of the *A. hydrophila* could not be ascertained.

**Conclusion:** Post-operative *Aeromonas* infection is rare but very serious, and requires particularly vigilant monitoring. The mortality of *Aeromonas* necrotizing soft-tissue infections where the microorganism is simultaneously isolated from blood culture is documented to be extremely high. In all cases of rapidly progressive necrotizing infections, *A. hydrophila* should be kept in mind and a fluoroquinolone/aminoglycoside should be added to the surgical and medical management. The microbiology laboratory should be alert in dealing with Gram-negative, *b*-haemolytic isolates so that an oxidase or deoxyribonuclease screen is performed to differentiate *A. hydrophila* from microbiologically similar organisms.

**Keywords:** *Aeromonas hydrophila*; fatal; myonecrosis; sepsis; trauma.

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**Introduction**

*Aeromonas hydrophila* is a Gram-negative, motile, oxidase-positive, facultative anaerobic bacillus, most commonly isolated from fresh water or brackish water (Janda & Abbott, 2010). Gastrointestinal illnesses, mostly self-limiting diarrhoea, and skin and soft-tissue infections (SSTIs) are the most common infections attributed to *A. hydrophila* (Janda & Abbott, 2010). *A. hydrophila* is implicated in a wide spectrum of SSTIs, ranging from cellulitis to life-threatening necrotizing fasciitis (NF) and myonecrosis (Janda & Abbott, 2010). Most reported cases of fulminant *A. hydrophila* necrotizing soft-tissue infections occur following a history of trauma sustained in an aquatic environment (Janda & Abbott, 2010). However, fatal *Aeromonas* myonecrosis and gas gangrene without antecedent trauma, underlying liver disease, malignancy or immunosuppression has only rarely been reported in the literature (Minnaganti et al., 2000). Here, we report a case of fulminant, fatal, spontaneous *Aeromonas* sepsis and myonecrosis in a patient who had undergone coronary angioplasty.

**Case report**

A 50-year-old female, a known case of old coronary artery disease, well-controlled hypothyroidism, diabetes mellitus (controlled) and a past history of anterior wall myocardial infarction, was admitted to our hospital for percutaneous transluminal coronary angioplasty. A coronary angiogram at our hospital at an earlier date had revealed triple vessel disease. Percutaneous transluminal coronary angioplasty and stenting (Evdorimelus eluting stent) to the right coronary artery were performed through a right radial artery approach. The procedure was uneventful and the
patient was shifted to the ward. Late on the second postoperative day, the patient complained of increasing pain in the lateral aspect of the right lower leg associated with mild swelling. Her initial vital signs were notable for a temperature of 99.2 °F, respiratory rate of 25 breaths min⁻¹, heart rate of 120 beat min⁻¹ and blood pressure of 141/76 mmHg. She was examined by the general physician who ordered laboratory investigations (total leukocyte count, differential count, quantitative C-reactive protein, blood and urine culture, smear for malaria parasite, and liver and kidney function tests). She was started on 4.5 g piperacillin/tazobactam intravenously every 8 h (after blood cultures were drawn) and supportive therapy. Blood counts showed a total white blood cell count of 6300 mm⁻³ (86 % neutrophils, 11 %lymphocytes, 2 %monocytes, eosinophils 2 %), haemoglobin 13.5 g dl⁻¹ and platelet count 161 000 mm⁻³. C-reactive protein was elevated at 6.10 mg dl⁻¹ (normal value <1 mg dl⁻¹). The international normalized ratio was 2.47. Partial thromboplastin time and activated partial thromboplastin time were elevated at 27.70 and 49.60 s, respectively. Electrolyte levels were within normal limits. Serum urea nitrogen was 16 mg dl⁻¹, creatinine 0.7 mg dl⁻¹ and magnesium 3.10 mg dl⁻¹. A peripheral smear was negative for malaria parasite and dengue virus NS1 antigen was negative (Dengue NS1 ELISA; J. Mitra). Liver function was deranged with total bilirubin 1.20 mg dl⁻¹, alkaline phosphatase 112 IU ml⁻¹, aspartate aminotransferase 67 IU ml⁻¹, alanine aminotransferase 88 IU ml⁻¹, total proteins 7.30 gm dl⁻¹, albumin 3.90 gm dl⁻¹ and globulin 3.40 gm dl⁻¹. Early on post-operative day 3, her fever spiked to 104 °F. She was distressed, and on clinical examination, severe oedema of the right lower limb, induration and blistering of the leg was noted. Crepitus was absent. At this time, motor and sensory function of the limb was not impaired and pulses of the tibial and popliteal artery could be palpated. Intravenous benzyl penicillin and clindamycin were added. Colour Doppler evaluation of the arterial and venous system of the right lower limb was negative for critical stenosis and deep-venous thrombosis but revealed loss of normal muscle architecture in the anterolateral aspect of the right leg with evolving areas of myonecrosis. Emergency computed tomography peripheral angiography was sought for better characterization of the vessels. The general condition of the patient was worsening with severe pain. Within 2 h, blisters and gangrenous patches had appeared over the entire right leg. She became hypotensive (blood pressure 90/60 mmHg, requiring inotropic support) and was shifted to the coronary intensive care unit for impending intubation and requirement of mechanical ventilation. Computed tomography lower-limb angiography had revealed oedematous right soleus, flexor hallucis longus and peroneus longus muscles with interspersed intramuscular air foci in the posterior calf extending up to the proximal shaft of the tibia and fibula suggestive of myonecrosis (Fig. 1). Pockets of air foci with fat stranding were also noted extending to the subcutaneous plane of the anterior abdominal wall in the right paramedian and left lateral infra-umbilical region. The patient was guided to the operating theatre under a team headed by the vascular surgeon. Intra-operatively extended subcutaneous emphysema was noted, with foul smelling areas of necrosis in most of the right soleus, flexor hallucis longus and peroneus longus muscles. Wide resection of all necrotic tissue was done. There was extensive myonecrosis and no viable muscles that bled when cut or contracted upon stimulation with electrodiathermy were left. Fasciotomies were done to prevent compartment syndrome. In view of the severe, irreparable vascular injury in an ischaemic limb, limb salvage was not possible and above-knee amputation was decided inside the operating theatre as a life-saving measure. Subsequently, the patient was transferred to the intensive care unit. Cultures of tissue specimens obtained intraoperatively were sent for Gram staining, aerobic, anaerobic and fungal culture, and histopathological opinion. A Gram stain of the purulent aspirate demonstrated many white blood cells and few Gram-negative bacilli. After overnight

![Image](https://example.com/image1.jpg)  
**Fig. 1.** Computerized tomography of the right leg showing swelling and disruption of the anatomy of the muscular structures with gas present within them, together with oedema, haziness and liquid collections in the subcutaneous fat.
incubation, large, round, opaque β-haemolytic colonies were obtained on blood agar and were motile and oxidase positive (Fig. 2). The colonies were non-lactose fermenting on MacConkey agar (Fig. 3). The Gram-negative rods were identified as *A. hydrophila* using a Vitek 2 system. The organism was sensitive to ceftazidime (MIC <1 μg ml⁻¹), ceftriaxone (MIC<1 μg ml⁻¹), cefepime (MIC<1 μg ml⁻¹), ceferazone/sulbactam (MIC<8 μg ml⁻¹), piperacillin-tazobactam (MIC<4 μg ml⁻¹), imipenem(MIC <1 μg ml⁻¹), meropenem (<0.25 μg ml⁻¹), amikacin (MIC <2 μg ml⁻¹), gentamicin (MIC<1 μg ml⁻¹), tobramycin (MIC<1 μg ml⁻¹), ciprofloxacin (<0.25 μg ml⁻¹), levofloxacin (<0.12 μg ml⁻¹), tetracycline (MIC<1 μg ml⁻¹), tigecycline (MIC<0.5 μg ml⁻¹), colistin (MIC 2 μg ml⁻¹) and trimethoprim/sulfamethoxazole (<20 μg ml⁻¹) and was resistant to ampicillin and ampicillin-sulbactam (MIC >32 μg ml⁻¹). *A. hydrophila* was also isolated from a pair of blood cultures after 24 h of incubation. Post-operatively, the patient remained in the intensive care unit, intubated and in septic shock, and succumbed to cardiac arrest.

**Discussion**

*Aeromonas* spp. are Gram-negative bacilli found in all freshwater environments as well as in brackish, chlorinated and unchlorinated water, and are uncommon pathogens in human infection. The bacterium is transmitted to humans via ingestion of food, water contaminated with soil or faeces, and/or ingestion of contaminated fish or reptiles (Janda & Abbott, 2010). Self-limiting gastroenteritis is the most common clinical manifestation in immunocompetent individuals (Janda & Abbott, 2010). Any organ system can be affected in immunocompromised hosts resulting in *Aeromonas* pneumonia, sepsis or meningitis, and both immunocompetent and immunocompromised hosts can suffer from *Aeromonas*-infected wounds (Janda & Abbott, 2010). The three types of wound infection that can stem from *A. hydrophila* in humans are cellulitis, myonecrosis with NF, and ecthyma gangrenosum (Gold & Salit, 1993). Non-bacteraemic cellulitis is the most common infection associated with *A. hydrophila*, and previous surgery or local trauma in an aqueous environment are the usual predisposing factors (Gold & Salit, 1993). Myonecrosis with NF and ecthyma gangrenosum are extremely rare and can have fatal or seriously debilitating outcomes such as amputation, and are almost universally associated with antecedent trauma sustained in an aquatic environment, burns or leech therapy (Gold & Salit, 1993). Two mechanisms have been proposed to explain the onset of *Aeromonas* SSTI. In the first, the bacterium invades through the trauma area and causes primary SSTI, which is followed by secondary sepsis. In the other, sepsis is first
induced by this bacterium, followed by secondary metastatic lesions of skin and soft tissue. It has been suggested that this bacterium causes sepsis via the intestinal–portal route (Janda & Abbott, 2010).

NF and gas-forming myonecrosis both represent subtypes of severe necrotizing soft-tissue infections, which share certain similarities in their clinical presentation (Tilkorn et al., 2012). Pain out of proportion to the physical findings is one of the cardinal early findings of NF. Local skin tenderness, erythema, oedema and warm skin gradually progress to blisters and bullae formation due to ischaemia-induced necrosis (Tilkorn et al., 2012). Lack of a primary muscular involvement is also regarded as pathognomonic of early NF; however, muscular involvement is a sign of advanced NF and is associated with grave prognosis and poor survival (Tilkorn et al., 2012).

Microbiologically, NF is classified as either type I (polymicrobial) or type II (monomicrobial) (Cheung et al., 2009). Type I infections, the commoner variety, result from a synergistic infection due to a mixture of aerobic and anaerobic organisms, and usually occur in patients with co-existing diabetes mellitus or chronic renal failure (Cheung et al., 2009). Monomicrobial infection is almost synonymous with group A streptococcal infection, although there are recent reports of community-acquired methicillin-resistant Staphylococcus aureus attributing to this (Tsitsilonis et al., 2013). There is widespread tissue necrosis underlying apparently viable skin. Gas is usually not evident. Varicella-zoster virus infection and use of non-steroidal anti-inflammatory drugs are reported to be risk factors. NF due to halophilic Vibrio infection (Vibrio parahaemolyticus, Vibrio alginolyticus, Vibrio fluvialis, Vibrio vulniﬁcus, Vibrio hollisae and Vibrio danseae), as well as Aeromonas infection, are also increasingly being reported (Finkelstein & Oren, 2011).

A. hydrophila myofascial necrosis and sepsis in patients without associated trauma, haematological malignancies, liver disease or neutropenia is extremely rare. Minnaganti et al. (2000) reported a case of fatal A. hydrophila NF of the left upper extremity in an 85-year-old man. In our patient, there was no history of trauma or any other focus of injury on physical examination. There was no history of diarrhoea in the recent past. A. hydrophila was isolated from blood and blister fluid, as well as intra-operatively obtained tissue culture. This is the first case of Aeromonas myonecrosis in our facility. There has been no other case documented with similar clinical presentation. We periodically conduct microbiological analysis of drinking water (reverse osmosis water) as well as endotoxin levels of reverse osmosis water supplied to critical areas like dialysis, the catheterization laboratory and operating theatre complex. The endotoxin level of reverse osmosis water was <0.125 EU ml⁻¹ (acceptable level <0.25 EU ml⁻¹). Aeromonas was not isolated from water supplies in our hospital or the patient’s stool cultures. The portal of entry in the present case could not be ascertained, but was most likely to have originated from colonization of the gastrointestinal tract and subsequent seeding of the blood stream. The mortality in Aeromonas necrotizing soft-tissue infections, where the microorganism is simultaneously isolated from blood culture is documented to be extremely high (Chen et al., 2011).

Clinical isolates of Aeromonas are susceptible to a wide range of antibiotics such as chloramphenicol, tetracycline, trimethoprim-sulfamethoxazole, aminoglycosides, broad-spectrum cephalosporins, imipenem and meropenem. However, they are universally resistant to penicillin, ampicillin, carbenicillin and cefazolin (Janda & Abbott, 2010). The finding of a co-existing chromosome-encoded cephaplorinase and carbapenemase in clinical isolates of Aeromonas raises concerns about the emergence of resistant mutants during antimicrobial therapy (Walsh et al., 1995). The emergence of cefotaxime resistance has also been observed in two (3.4%) of 58 episodes of monomicrobial Aeromonas bacteraemia treated with a cephaplorin (Ko et al., 2000). In Taiwan, only 50 and 60% of 234 clinical Aeromonas strains were reported to be susceptible to tetracycline and co-trimoxazole, respectively, which further decreases the potential choices for the treatment of Aeromonas infections (Ko et al., 1996). Fluoroquinolones have been shown to have excellent in vitro and in vivo activity against clinical Aeromonas isolates (Ko et al., 2003). The microbiology laboratory should be alert in dealing with Gram-negative, β-haemolytic isolates so that an oxidase or deoxyribonuclease screen is performed to differentiate A. hydrophila from microbiologically similar organisms and hence avoid the possibility of a fulminating infection. To conclude, in all cases of rapidly progressive necrotizing infections, A. hydrophila should be kept in mind and a fluoroquinolone/aminoglycoside should be added to the surgical and medical management.

References


