Case Report

Fatal spontaneous Aeromonas hydrophila myonecrosis and sepsis without antecedent trauma

Bijayini Behera, Tushar Kumar Mohapatra, K. Narasaraju, Nihar Ranjan Pradhan, K. Murali Mohan Reddy and Pavani Nimmala

Correspondence
Bijayini Behera
dribinny2004@yahoo.co.in

1All India Institute of Medical Sciences, Bhubaneswar
2Yashoda Hospital, Secunderabad, India

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, β-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.

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 an earlier date had revealed triple vessel disease. Percutaneous transluminal coronary angioplasty and stenting (Elovolemus 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⁻¹. 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 tests (blood pressure 90/60 mmHg, requiring inotropic support) 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 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 noted extending to the subcutaneous plane of the anterior abdominal wall in the right paramedian and left lateral infra-umbilical region. The patient was transferred to the 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 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

![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.](image-url)
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), cefoperazone/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 metas- 
tatic 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 involve- 
ment 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 
para-haemolyticus, Vibrio alginolyticus, Vibrio fluvialis, 
Vibrio vulniﬁcus, Vibrio holliiae and Vibrio daniela), 
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 peri- 
odically 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 
cephalosporinase 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 
cephalosporin (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 deoxyribonucleic acid screen is 
performed to differentiate A. hydrophila from microbiolo- 
gically similar organisms and hence avoid the possibility of 
a fulminant 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

Chen, I.-C., Li, W.-C., Hong, Y.-C., Shie, S.-S., Fann, W.-C. & 
Hsiao, C.-T. (2011). The microbiological proﬁle and presence of 
bloodstream infection inﬂuence mortality rates in necrotizing 
fasciitis. Crit Care 15, R152.

necrotising fasciitis in the extremities. Hong Kong Med J 15, 44–52.

marine bacterial pathogens: epidemiology, diagnosis, and 

skin and soft tissue: report of 11 cases and review. Clin Infect Dis 16, 
69–74.


(1996). Increasing antibiotic resistance in clinical isolates of 

Clinical features and therapeutic implications of 104 episodes of 


