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Case report

Necrotizing fasciitis and gas gangrene due to *Aeromonas hydrophila* in an immunocompetent host: A rare entity☆

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ABSTRACT

Aeromonas hydrophila, widely distributed in various aquatic environments, is recognized as emerging opportunistic pathogens mainly causing gastrointestinal and wound infections. Necrotizing fasciitis and gas gangrene attributable to *A. hydrophila* are believed to develop mainly in immunocompromised hosts and have required amputation as a life-saving measure in many of these individuals. The present case re-emphasizes the virulent nature of this organism requiring amputation even in an immunocompetent host and hence, the critical need for early recognition and appropriate targeted therapy, especially after minor traumatic injuries which usually tend to get neglected.

Introduction

Aeromonas species, widely distributed in various aquatic environments (including both fresh water and brackish water bodies), moist soil, sewage, and other non-fecal organic material (fruits, vegetables, dairy products, meat, and fish) are recognized as emerging opportunistic pathogens mainly causing gastrointestinal and wound infections [1–3]. Skin and soft-tissue infections (SSTIs) related to *Aeromonas* species can range from mild cellulitis to necrotizing fasciitis (NF) and fulminant myonecrosis with gas formation, and of more than 36 species identified, *Aeromonas hydrophila* is the most frequently isolated [2,3]. Necrotizing fasciitis and gas gangrene attributable to *A. hydrophila* develop mainly in immunocompromised hosts, such as persons with underlying diabetes mellitus, end-stage renal disease, hemodialysis patients, hematological disorders, liver cirrhosis, and other hepatobiliary diseases [4–10]. Fatality rates can be as high as 75–100% when complicated with bacteremia and organ failure [4–10]. Amputation of the limb as a life-saving measure is required in many of these patients [4,8–10], with a report describing 27.3% (3 out of 11) patients requiring amputation [9]. We report a case of necrotizing fasciitis and gas gangrene resulting from *A. hydrophila* infection in an apparently immunocompetent, otherwise-healthy young adult requiring amputation, highlighting the virulent nature of the infecting agent.

Case

A 35-year-old man, hotel-cleaner by occupation, presented to the emergency with a 5-day history of pain, swelling, discharge and peeling of skin of left leg. He had sustained an injury while walking barefoot on the road following which, he had developed a non-healing ulcer leading to swelling of left foot which was gradually spreading upwards. The patient was non-diabetic and otherwise apparently healthy before the current episode of trauma. He gave no history of fever or blackouts. On admission, he was conscious and oriented, but had low blood pressure (108/55 mmHg), high pulse rate (119/min) and low temperature (36.5 °C). There was swelling of the left leg up to mid-thigh associated with foul-smelling discharge from the wound, several erythematous patches and blebs, with blackening, blistering, and peeling of skin accompanied by loss of sensation and gross loss of motor function (Fig. 1A). Pulses of the popliteal, anterior tibial and posterior tibial arteries were not detectable, but subcutaneous crepitus could be felt over the entire leg. Laboratory investigations were deranged showing elevated levels of aspartate aminotransferase (225 IU/L), alanine aminotransferase (83 IU/L), urea (52 mg/dL), total bilirubin (6.8 mg/

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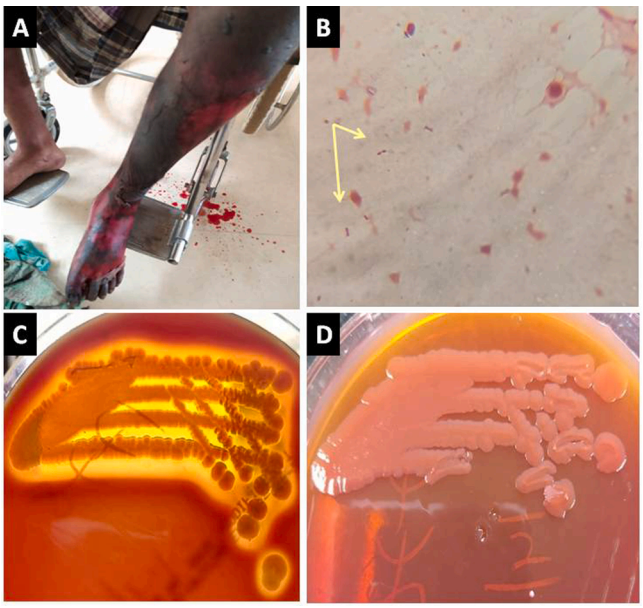

Fig. 1. Necrotizing fasciitis and gas gangrene due to *Aeromonas hydrophila* showing (A) Lower limb view on presentation, with blackening, blistering and peeling of skin (B) Gram-smear of intra-operative wound tissue, 1000 × (C) Colony morphology on blood agar and (D) Colony morphology on MacConkey agar.

dL) and low levels of total protein (3.6 g/dL), albumin (1.4 g/dL), and albumin/globulin ratio (0.6). Blood hemogram parameters were within normal range, except for slight decrease in platelet count. The patient was empirically started on amoxicillin-clavulanate 1.2 g and clindamycin 600 mg every 8 h, for presumed gas gangrene. However, in view of progressive nature of the lesion and ensuing critical condition, he underwent emergent left above-knee amputation along with extensive wound debridement until a healthy tissue layer was reached.

Intra-operative tissue biopsy showed lots of lysed soft-tissue material with many gram-negative bacilli lying singly (Fig. 1B). Culture on blood agar after overnight incubation revealed pure growth of 1–3 mm, translucent, smooth, beta-hemolytic colonies with 'double-zones' of hemolysis (Fig. 1C). MacConkey agar showed pure growth of non-lactose fermentative, motile, gram-negative, oxidase-positive bacilli identified as *Aeromonas hydrophila* by Vitek-2 identification system (bioMérieux, Marcy l'Etoile, France) (Fig. 1D). No anaerobes or any other bacteria were detected from the necrotic tissue or exudate. In a standard disc-diffusion test, the isolate was susceptible to all the tested antibiotics i.e., third-generation cephalosporins, aminoglycosides, fluoroquinolones, piperacillin-tazobactam, trimethoprim-sulfamethoxazole, and carbapenems [11]. Therapy was changed to a combination of parenteral piperacillin-tazobactam 4.5 g every 8 h and amikacin 750 mg every 24 h alongwith aggressive supportive management. The post-operative course was uneventful and the patient remained hemodynamically stable with no further complaints till discharge.

Discussion

Aeromonas hydrophila, a Gram-negative facultative anaerobic bacillus, is a member of the Family *Aeromonadaceae* and a common pathogen of fish, reptiles, and amphibians [1,2]. As an emerging pathogen in humans, it has the potential to cause several types of SSTIs ranging from mild cellulitis to fulminant myonecrosis and extensive fascial and subcutaneous tissue necrosis usually known to occur in individuals with some form of compromised immune status, such as underlying diabetes mellitus, end-stage renal disease, hemodialysis patients, hematological disorders, liver cirrhosis and other hepatobiliary diseases [2,9,10]. However, such necrotic soft-tissue infections including, necrotizing fasciitis and myonecrosis due to *A. hydrophila* have also been known to occur in previously healthy, apparently non-immunocompromised individuals [12–21]. Most of these cases of *A. hydrophila* necrotizing infections and myonecrosis have been associated with environmental exposure to contaminated water and are particularly related to traumatic occupational injuries or unexpected contact via recreational sporting activities or motor vehicular accidents [12,15,18–21]. Even minor trauma such as prick from fishbones and intravenous infusion lines have led to catastrophic events resulting in death of the patients [13,16,17]. In the present case also, penetrating trauma followed by exposure to possibly contaminated aquatic environment by virtue of his professional activities seems to be the major predisposing factor in acquisition of infection and subsequent development to necrotizing fasciitis and gas gangrene in the patient. Apart from trauma, an interesting case secondary to bite of a venomous snake has been recorded in an immune-competent adult [14] while a case secondary to human bite by a 3-year old child has been reported in a patient with underlying acute myeloid leukemia [8].

Necrotizing fasciitis is an aggressive and fulminant disease, usually classified into 4 types [22,23]. Type 1 or polymicrobial NF (70–80% of cases) comprises mixed anaerobes and aerobes and Type II or monomicrobial (20–30% of cases) is classically caused by group A β-hemolytic streptococcus. *Aeromonas* along with other water-borne pathogens such as *Vibrio vulnificus* causes Type III NF (< 5% of cases) while, Type IV, is comprised mainly of *Candida* species. Type III necrotizing soft tissue infections have a mortality rate of 30–40% mortality, generally higher than Types I and II, but lower than Type IV which has a mortality rate of 47% [22,23]. The pathogenesis of *A. hydrophila* can be attributed to the several toxic enzymes, virulence factors and secretion systems elaborated by the bacteria [2,3]. In view of the rapid downhill course of the entity and aggressive nature of the implicated pathogen, management should be prompt. Freischlag et al. [24] and Kobayashi et al. [25] saw a rise in mortality from 36% to 70% and from 28% to 45%, respectively when surgery was delayed. Prompt aggressive debridement, widespread resection of necrotic tissue, relaxation incision, and aggressive saline dressing in combination with culture-directed antimicrobial therapy is the key to a successful outcome. Amputation of the limb as a life-saving measure is required in many immunocompromised patients [4,8,10]. However, the evolving nature of the condition has also necessitated amputation in many immunocompetent individuals [12,17,20] as happened in our patient.

The present case re-emphasizes the virulent nature of *A. hydrophila* requiring amputation even in an immunonocompetent host and hence, the critical need for early recognition and appropriate targeted therapy, especially after minor traumatic injuries which usually tend to get neglected.

Ethical approval

Ethical approval was obtained from the Institutional Ethics Committee of AIIMS Bhubaneswar, Odisha, India.

Reference number- T/IM-NF/Micro/20/202 dated 22.03.2021.

Consent

Obtained.

CRediT authorship contribution statement

Srujana Mohanty: provided substantial contribution to the concept and design of the study; acquisition, analysis, and interpretation of data, did the literature search and drafted the manuscript. She is the Corresponding author who gave the final approval for the manuscript to be published. **S Manwar Ali:** was the treating physician, contributed to the acquisition, analysis, and interpretation of data for the work, helped in

the literature search, and critically revised the work for important intellectual content. **Pradeep Kumar Singh:** was the treating physician, contributed to the acquisition, analysis, and interpretation of data for the work, helped in the literature search, and provided inputs for important intellectual content.

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Declarations of interest

None.

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