CASE REPORT

Surviving the Terror of the Deep: A *Vibrio vulnificus* Case Report

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ABSTRACT

Vibrio vulnificus is one of the most virulent pathogenic Vibrio species commonly implicated in gastroenteritis, soft tissue infection and septicemia related to seafood consumption or seawater contact. We describe a patient who survives a combination of all three common manifestations of *V. vulnificus* infection. A 40-year-old male patient, who is a known Chronic Hepatitis B with liver cirrhosis and oesophageal varices, presented with intermittent fever, lower limb pain and redness and diarrhea for the past three weeks. He had a history of consuming raw oysters seven days prior to admission. Blood culture showed grew oxidase-positive non-sucrose fermenting Gram-negative bacillus, subsequently identified as *Vibrio vulnificus*. The patient was treated with intravenous ceftazidime and oral doxycycline for seven days duration. He was discharged well on day ten of admission. This fortunately mild presentation was probably due to a low infective dose of *V. vulnificus* exposure.
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CASE REPORT

A 40-year-old Malay gentleman, diagnosed with Chronic Hepatitis B 20 years ago, which was complicated with liver cirrhosis and oesophageal varices, presented with a 3-week history of shortness of breath which worsened on the day of admission. It is accompanied with bilateral painful erythematous lower limb swelling for a week. The patient also experienced fever and passing loose stools more than five times per day for two days. He had no cough, history of trauma, insect bite or anyone suffering similar symptoms.

Upon further questioning, the patient had consumed raw oysters two days preceding the diarrheal onset. He also had gone fishing in a saltwater pond two weeks prior; although he denied swimming in it.

Upon arrival at the emergency department, he was alert, conscious with a full Glasgow Coma Scale (GCS), tachycardic (pulse rate 108 bpm) and hypertensive with the blood pressure of 164/93 mmHg. He was afebrile and able to maintain his oxygen saturation to 96% on room air albeit tachypnoeic, with respiratory rate of 24/min. Lung examinations revealed stony dullness on percussion with fine crepitations over the right lower up to the middle zone. His abdomen was soft but distended with positive shifting dullness on percussion. Lower limb examination revealed bilateral pitting pedal oedema up to mid-shin level. His left calf was warmer, more erythematous and tender on palpation than the right side, while a three cm-diameter ruptured blister was noted on its posterior aspect (Fig. 1 (a) and (b).

Full blood count showed leucocytosis with neutrophil predominance (13.33 x 10^9, 89% neutrophils), mild normocytic normochromic anemia (Hb 10.0 g/dL) and thrombocytopenia (Plt 18 x 10^9/mm). In addition, his C-reactive protein (CRP) was elevated (146.80 mg/L). The liver function tests displayed total hyperbilirubinemia (50.0 µmol/L) and severe hypoalbuminemia (22 g/L) while other markers were unremarkable. His chest roentgenogram portrayed blunted right costophrenic angle, suggestive of right pleural effusion. He was admitted to the ward for decompensated liver cirrhosis and left lower limb cellulitis, in which he was empirically given intravenous (IV) ceftriaxone 2g stat and 1g twice daily for the latter.

A set of aerobic and anaerobic blood cultures were drawn prior to the commencement of antimicrobial agents. Both bottles were positive after a day of incubation with a preliminary Gram-stain showing Gram-negative curved and straight rods (BD Bactec™

FX System, Beckton, Dickinson and Company, New Jersey, USA) (Fig. 1 (c)). Isolate appeared as single, grey, mucoid colony on 5% Sheep blood agar and lactose fermenting, oxidase-positive colonies on MacConkey agar (ThermoScientific, Melaka, Malaysia) after 18 hours incubation, while subculture on thiosulfate citrate bile salt sucrose (TCBS) agar grew opaque green sucrose-nonfermenting colonies (Fig. 2).

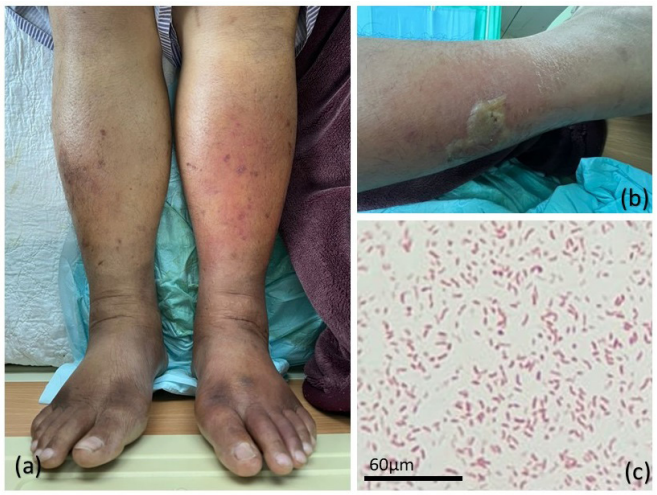

Fig. 1 : (a) Bilateral pedal oedema, with the left lower limb more erythematous and oedematous compared to the right, (b) a ruptured blister on posterior calf of left lower limb, and (c) preliminary gram stain of blood culture showing gram negative curved rods (100x magnification).

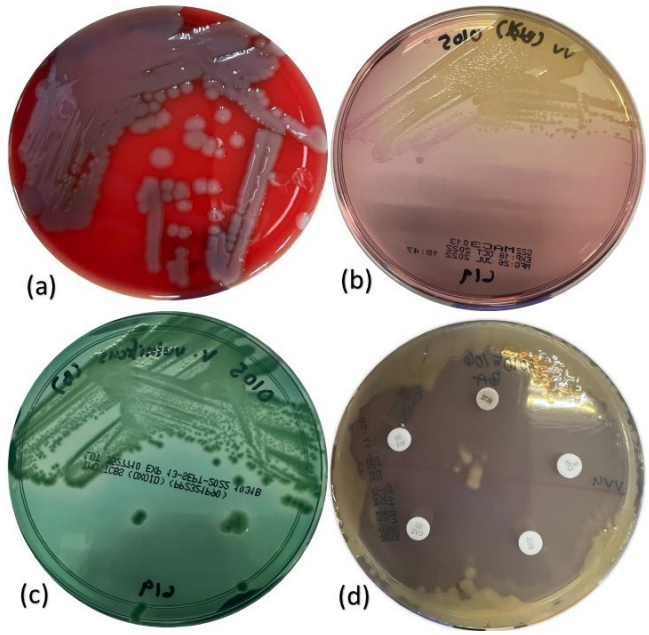

Fig. 2 : Cultures on (a) sheep blood agar, (b) MacConkey agar, and (c) thiosulfate citrate bile salt sucrose (TCBS) agar, and (d) antimicrobial susceptibility testing on Mueller-Hinton agar.

Identification of the organism was made using Vitek® GN (Biomйrieux, United States of America) and further proceeded with matrix-assisted laser desorption ionization time of flight (MALDI-TOF) MS (Bruker, Germany). Vitek® GN identified the colony as *Vibrio vulnificus* with 98% probability. Antimicrobial sensitivity was performed and interpreted according to Clinical and Laboratory Standards Institute (CLSI) M45 *Vibrio* spp. The organism was susceptible to ampicillin, ceftazidime, ciprofloxacin, trimethoprim-sulfamethoxazole and tetracycline. Definitive treatment of IV ceftazidime 2g 8-hourly, and oral doxycycline 100mg twice daily for seven days was given accordingly.

The patient had undergone both pleural and peritoneal tapping on day 2 and day 3 of hospital admission, respectively. A total of 1.1 litres of haemoserous pleural fluid and 3.2 litres of straw-coloured peritoneal fluid were drawn, with both fluids' bacterial cultures being negative upon two days of incubation.

The patient's diarrhoea has subsided immediately upon hospital admission. The stool culture sample, which was only collected after the 8th day of admission, was negative for the organism. With resolving symptoms, improving leucocytosis and reducing CRP to 15.60 mg/L, he was discharged well on day 10 of admission, following completion of antibiotics for seven days.

DISCUSSION

Since the tragic death of Criton, a Thasos Island fisherman, was described by Hippocrates in the 5th century, numerous fatalities have been reported from this gram-negative motile organism, causing it to be termed "the terror of the deep". This halophilic, warm climate-loving organism of the Vibrionaceae family is an autochthonous seafood and seawater bacterium in our tropical country.

Attachment of the organism is mediated by *OmpU* and *IlpA* membrane proteins, pili and flagella. Anti-phagocytic capsular polysaccharide ensures the organism's in vivo survival. Host cell lysis can also be due to virulence factors such as repeats-in-toxin A1 (RtxA1) and VvpE and VvpM metalloproteases (1).

Following contact with seawater or seafood consumption, *V. vulnificus* presents commonly as one of the three - primary bloodstream infection, wound infection or gastroenteritis. Raw oyster consumption is frequently implicated for primary *V. vulnificus* septicaemia, whereas exposure to seawater or raw

seafood juice to open wounds is the frequently associated risk factor for wound infection. Malay ethnicity and male gender have higher risk of septicaemia due to cockles consumption (2). Clinical symptoms include fever, chills, skin lesions, nausea, vomiting, abdominal pain, hypotension and diarrhea.

With mortality rate reaching 58%, *V. vulnificus* recorded the highest among the members of its genus (3). Moreover, higher mortality of *V. vulnificus* sepsis were found in hepatic or kidney disease, high APACHE II score, septic shock, hypoalbuminaemia or neutrophilia on presentation (4). However, despite this patient having liver cirrhosis, hypoalbuminaemia and neutrophilia and presenting with all common manifestations of *V. vulnificus* – diarrheal gastroenteritis, cellulitis and septicaemia – his clinical course was mild and gradual, and the patient survived the infection excellently.

We hypothesize that this fortunately mild presentation was probably due to a low infective dose of *V. vulnificus* exposure. *V. vulnificus* load burden in oysters is known to be higher upon late consumption rather than directly after harvest due to its continuous postharvest bacterial replication if the oysters were not immediately cooled to less than 7°C (1). There was neither the exact amount of raw oysters' consumption elicited during history taking, nor were there any investigations conducted on the amount of bacterial load of raw oysters at the site of his visit. However, it is possible that the patient may have taken the filter feeders in small amounts or almost immediately postharvest.

In general, survival of *V. vulnificus* infections is infrequent, and when occur, many were left with post-infection debilitating sequalae due to aggressive limb-or-life surgeries (5). The clinical progression of our case was mild; hence, no operation was indicated for him.

Our patient's isolate is susceptible to all tested antibiotics, prompting the clinicians to optimize the antimicrobial according to the sensitivity testing. This antibiotic choice is compatible with the Infectious Diseases Society of America (IDSA) guideline for *V. vulnificus* skin and soft tissue infection. The National Antimicrobial Guidelines has no recommendation for *V. vulnificus* cellulitis, but recommends IV ceftriaxone 1g and oral doxycycline 100g, both twice daily for treatment of necrotizing fasciitis.

CONCLUSION

Patients with risk factors such as chronic liver disease should be highly suspected of *V. vulnificus* infection, and thorough enquiries regarding consumption of raw filter feeders and exposure to saltwater should be carried out in view of the country's year-round favorable, warm climate for the bacteria. Further studies are needed to investigate the survival factors of this hostile organism in order to attain a reduction in its mortality burden worldwide.

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