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Case Report

Microbiology Section

Case Report and Literature Review of Carbapenem Resistant *Shewanella Putrefaciens* Isolated from Ascitic Fluid

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ABSTRACT

Shewanella species are Gram-negative, non-fermentative, oxidase positive, motile bacilli with the major phenotypic characteristic of production of large amounts of hydrogen sulfide. *Shewanella putrefaciens*, primarily considered to be an environmental bacterium, is infrequently recovered from clinical specimens. Herein, we report a case of ascitic fluid infection with carbapenem resistant *Shewanella putrefaciens* in a patient with underlying liver disorder requiring repeated ascitic fluid tapping. Proper antibiotic therapy helped in complete recovery of the patient.

Keywords: Ascitic fluid, Non-fermenter, *Shewanella putrefaciens*

CASE REPORT

A 50-year-old male patient, suspected to be a case of alcoholic liver cirrhosis was referred to our cancer institute located in north India in June 2011. He presented with the chief complaints of fever and abdominal discomfort since last four days. The patient had a history of progressive abdominal distension since eight months, swelling in both lower limbs since last two months and difficulty in breathing since one month. He had undergone repeated ascitic tapping earlier to relieve him of his symptoms. The patient was a chronic bidi smoker and alcoholic since last 20y but non-diabetic and non-hypertensive.

On examination, the patient appeared pale and dehydrated and his vital signs were as follows: temperature 39.6°C; PR 110/min; respiratory rate 22/min; BP 100/60 mmHg. Abdominal examination revealed gross ascitis with mild hepatomegaly. The patient had bilateral pitting pedal oedema but no engorged veins. No bleeding or discharge was found on per rectal examination. Hematological investigations revealed a hemoglobin level of 6.6 g/dl, white cell count of 19.71 × 109/ litre with neutrophilic predominance (91%), platelet count was 105× 109/litre, C- reactive protein (CRP) and erythrocyte sedimentation rate (ESR) were elevated (CRP: 58mg/l; normal range 0-8 mg/l, ESR:63 mm/hr; normal range: <10 mm/hr), serum levels of aspartate aminotransferase was 76.4 (normal<37 U/l) while alanine aminotransferase was 33 U/l (normal<40 U/l). The patient was non-reactive for anti HIV antibodies. Serum for Hepatitis B and Hepatitis C was tested by Rapid card test method using HEPACARD test kit and HCV TRI DOT test kit respectively. Both the tests yielded negative results.

Blood samples and ascitic fluid sample were drawn and sent to laboratory for examination. The patient was started on empirical antimicrobial therapy with intravenous pipercillin and tazobactam. Blood culture bottles were incubated in BacT Alert system (BioMe'rieux, Durham, North Carolina/USA) for continuous monitoring. Ascitic fluid sample was cloudy in appearance, cell count being 600cells/mm^3. Smear for cytology showed presence of abundant polymorphonuclear cells. Gram stain of the fluid showed presence of numerous pus cells and Gram negative rods. After overnight incubation, small brown, mucoid, non- hemolytic colonies were observed on blood agar. On Mac-Conkey agar, non-lactose fermenting colonies with a fishy smell were obtained in pure culture. The colonies were catalase and oxidase positive. The cultured isolate was a Gram negative, motile rod that was subsequently identified as *Shewanella putrefaciens*. Identification was performed with the Automated Vitek-2 Compact(C) system version 6.01 (Biomerieux, North Carolina/USA) which gave an excellent confidence level for identification. Antimicrobial susceptibility determinations were automatically performed through the VITEK-2 system using AST-N090 GN card. Antibiotic susceptibility testing by this method revealed resistance to pipercillin, ceftazidime, tobramycin cotrimoxazole, imipenem and meropenem.

The isolate was sensitive to pipercillin+tazobactam,cefoperazone+sulbactam, cefepime, gentamicin, levofloxacin, tigecycline and colistin while intermediately sensitive to ampicillin+sulbactam, ceftriaxone, amikacin and ciprofloxacin. Blood culture remained sterile. A repeat ascitic fluid sample was taken and cultured which yielded the same organism with the same antibiotic sensitivity profile.

After three days of the start of therapy with pipercillin+tazobactam (4.5 g IV 8 h) and therapeutic ascitic fluid tapping, there was a complete disappearance of fever and a remarkable improvement of the patient's clinical status too. From fifth day onwards, the patient was switched to oral antibiotics. The patient was followed up for 10d. There was no recurrence during the period of follow up of the patient.

DISCUSSION

Shewanella putrefaciens, previously known as *Pseudomonas putrefaciens*, was placed in a new genus *Shewanella* named after James Shewan in 1985 [1]. Although, there are more than 30 species of genus *Shewanella*, *Shewanella* algae and *Shewanella putrefaciens* are the two species which are pathogenic to humans [2]. These two species can be differentiated on the basis of utilization of various carbohydrates, growth at 42°C, growth in the presence of 6.5% NaCl (w/v), nitrite reduction, presence of a hemolytic substance etc [3].

Shewanella spp. have been implicated in skin and soft tissue infections, bacteraemia, biliary tract infections, empyema, endocarditis, dacryocystitis, intracranial abscess, arthritis, peritonitis, ventilator-associated pneumonia, and ear infections [1,4]. The major risk factors of *Shewanella putrefaciens* infection are hepatobiliary disease, malignancy, peripheral vascular disease with chronic leg ulcer, poor hygiene and lower socio-economic status [1,4].

Shewanella putrefaciens has often been reported to cause peritonitis in patients following peritoneal dialysis [5,6].

From India, there are several reports of isolation of Shewanella algae from various clinical samples [4,7-9]; while Shewanella putrefaciens

have been reported in patients with infective endocarditis, non-healing ulcers of chest wall and lower leg have also been reported [4,10].

In the present case, *Shewanella* putrefaciens was the only bacterium isolated on multiple occasions and the patient responded to targeted treatment, supporting the fact that *Shewanella putrefaciens* was the true agent of the disease. Our patient's underlying liver disorder further support the diagnosis as hepatobiliary disease is a known risk factor for these infections. However, the source of infection in this case is unknown. Though, the literature supports a strong association of *Shewanella* infections and exposure to sea water but there was no such history in this case. The patient was neither afflicted with any skin lesion nor did he recall being around spoiled food. It may be possible that repeated ascitic tapping may have introduced this organism into the patient's peritoneal cavity. To the best of our knowledge, this is the first report of isolation of *Shewanella putrefaciens* from ascitic fluid.

According to literature, *Shewanella* species are susceptible to aminoglycosides, carbapenems, erythromycin and quinolones but resistant to penicillin [7]. Basir et al., reported isolation of aminoglycoside resistant *Shewanella putrefaciens* from splenic abscess in a patient with underlying diabetes [11]. Resistance to pipercillin+tazobactam and imipenem has also been reported [1,12].

CONCLUSION

This case highlights the importance of further processing of oxidase positive, non-fermenting Gram negative rods as this rare pathogen may otherwise be missed. Since carbapenem resistance is rapidly emerging in this rare organism, urgent steps need to be taken to prevent the spread of this resistant bacterium. Resistance to carbapenems is of concern in tropical countries as it limits therapeutic options.

Thus, utmost microbiological vigilance is required to correctly identify this rare organism so that proper antibiotics can be administered to the patient based on the antibiotic sensitivity report, and prevent the emergence of resistant strains.

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