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Case Report

A fatal case of cupriavidus pauculus causing septicemia after duodenal perforation: Case report from university teaching hospital

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ABSTRACT

Cupriavidus pauculus, a gram-negative bacterium is found ubiquitously in soil and water. It is very rare organism to cause human infection. Here we report a fatal case of septicaemia due to *C.pauculus* in a young female with duodenal perforation. Blood culture showed isolation of *C. pauculus* identified by MALDI-TOF-MS. The patient was treated with meropenem and piperacillin and tazobactam, but she died nine days after surgery. To our knowledge, this is the rare case report of *C. pauculus* causing septicemia after duodenal perforation.

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1. Introduction

Cupriavidus pauculus formerly CDC group IV c-2 is a gram negative, rod shaped, non-sporing, and motile bacteria. It has catalase and oxidase activity and grows readily on the ordinary laboratory culture media at 35°C–37°C. It is found widely distributed in soil and water.[1] *Cupriavidus pauculus* (*C. pauculus*), formerly named Wautersiapaucula, is a aerobic, non-fermentative bacterium, part of the *Cupriavidus species*.[2]It was initially classified in the genus Ralstonia. It was re-classified in the genus Wautersia in 2004. In the same year, the genus was renamed as Cupriavidus.[3] There are only few case reports of *C.pauculus* infection in immunocompromised patients and has associated with vascular access, use of parenteral nutrition or implantable cardiac defibrillator pocket infection. Also, reported in peritonitis, tenosynovitis, and meningitis, caused by this pathogen.[4,5] Clinical disease caused by this organism ranges from abscess to septicemia. However, it is difficult to identify *C.pauculus* accurately by conventional biochemical methods. Here we describea fatal case of septicaemia due to *C. pauculus* in a young female with duodenal perforation. To the best of our knowledge, this is the interesting case of culture-proven bacteremia caused by multi-drug resistant *Cupriavidus pauculus*.

2. Case Report

An 18-year-old female presented at midnight to the emergency department of Surgery of King George's Medical University, Lucknow atertiary care referral hospital in North India, with the chief complaints of on and offvomiting and severe abdominal pain for the past 12 hours. On examination, the patient was conscious and alert, but ill-looking. Laboratory evaluation at the time of admission revealed hemoglobin - 9 g%, total leukocyte count – 14,100/cumm, neutrophil – 78.3%, lymphocyte - 9%, eosinophil - 2%, monocyte - 2%, basophil - 0%. Procalcitonin level(13.98 ng/mL) and CRP (26.30 mg/L) were elevated. Serum bilirubin total-8.5mg/dl, bilirubin, direct-6.10mg/dl and alkaline phosphatase- 1025.3IU/L were elevated. Blood was collected with complete

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aseptic precaution into aerobic and anaerobic adult blood culture bottle (BacT/ALERT/3D; bio-Merieux, Marcy l'Etoile, France). She underwent emergency exploratory laparotomy which revealed duodenal perforation and peritonitis. Perforation was sutured and managed. During the surgery her SpO2decreased drastically and patient was intubated. Chest X-Ray after intubation showed cloudiness on both side. Post-operative chest computed tomography (CT) showed no significant finding (Figure 1). The patient was transferred to the Critical Care Unit of the hospital for further management. Aerobic culture bottle beeped positive sign of growth after 18 hours of incubation. The broth was then sub-cultured on 5% sheep blood agar and MacConkey agar. After overnight incubation, MacConkey agar showed growth of non-lactose fermenting colonies with regular borders, smooth consistency, dry appearance and non-pigmented were observed and on blood agar no haemolysis was observed (Figure 2 A,B)). Further identification was done MALDI-TOF MS using the VITEK MS system (bioMérieux). Thisisolate was identified as *Cupriavidus pauculus* with 99% probability. Simultaneously, antimicrobial susceptibility test was performed byVITEK Compact 2 system (bioMérieux) and the minimum inhibitory concentrations (MICs) and breakpoints were determined based on the recommendations of Clinical and Laboratory Standard Institute (CLSI). The organism was susceptible to piperacillin-tazobactam, meropenem, imipenemand levofloxacin. The strain was resistant to cefotaxime, ceftazidime, gentamicin, amikacin and aztreonam (Table 1).

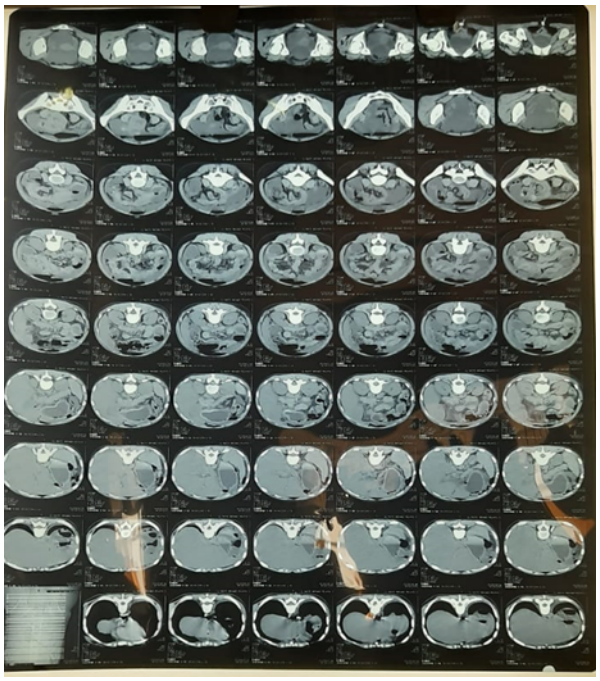

Figure 1: CT scan of abdomen: shows no significant abnormality

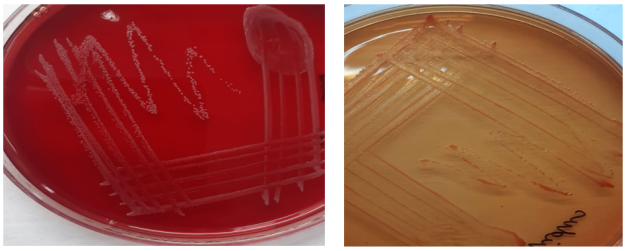

Figure 2: Cupriavidus pauculus colonies on **(A)** Blood agar: White transparent colonies; **(B)**: Mac conkey agar: Nonlactose fermenters, Oxidase positive colonies

Treatment - Based on culture and susceptibility reports patient was administered intravenous meropenem 1 gm IV every 8 hours for 7 days and piperacillin-tazobactum 4.5 gram for 5 days.

Outcome and follow up - Despite antibiotics the condition of the patient deteriorated and repeated blood cultures remained positive for *C.pauculus*. After seven days patient's clinical condition deteriorated and was pronounced dead at day nine of ICU admission due to multiple organ failure.

3. Discussion

Cupriavidus spp. are ubiquitous environmental organisms, mainly in water and plants. *C. pauculus* is the most important member of this family responsible for opportunistic infections and which can sometimes cause outbreaks.[6] It is believed to cause nosocomial infections by the contamination of nebulization solution, ultrafiltrate water, thermos-regulator reservoir water, extracorporeal membrane oxygenation system (ECMO), tap water, hydrotherapy pools, and bottled mineral water.[7] The genus Cupriavidus consists of Gram-negative, non-fermenting bacteria are usually environmental organisms found mainly in soil, water, and on plants. *C. pauculus* and *C. gilardi*i can cause infections in patients with malignancies, transplants, and AIDS.[8] Its infections in patients have been reported to cause urinary tract infections, bacteremia, pneumonia and meningitis.[9] Nosocomial outbreaks have been reported on rare occasions due to contaminated water.[10] There has been case series in which infections were related to the use of parenteral nutrition, therefore the TPN were dismissed in the ICU where the patient was admitted.[11] The timely and appropriate treatment of any infection depends on rapid and specific identification of causative microorganisms. The traditionally microbial identification by morphologic and biochemical characterization is cumbersome and difficult to interpret and thus causes delay in diagnosis which may lead to poor prognosis.[12] The MALDI-TOF MS, nanopore, 16S rRNA and next generation sequencing (NGS) technologies allows rapid and accurate detection of

Table 1: Results of blood culture and drug sensitivity test by vitek-ms

Result of Bacterial Blood Culture: Cupriavidus pauculus							
Results of drug resistance							
Antibiotic (MIC)	**Break point**	**Result**	**Sensitivity**	**Antibiotic (MIC)**	**Break point**	**Result**	**Sensitivity**
Piperacillin	16-128	16		Gentamicin	4-16	16	R
Ceftazidime	8-32	>32	R	Cefotaxime	8-64	64	R
Cefepime	8-32	4		Aztreonam	8-32	>16	R
Imipenem	4-16	2		Meropenem	4-16	2	
Levofloxacin	2-8	2		Amikacin	16-64	>32	R

bacterial pathogens.[13] The isolate identified in the present case was multidrug resistant and showed resistance to various group of antibiotics including imipenem, amikacin, gentamicin, and tobramycin which appears to be in concordance with previous studies.

The optimal therapeutic regimen for treating infections caused by *C. pauculus* remains unclear because of the limited data.[14] There is need to study the intrinsic drug resistance mechanism in *C. pauculus*. Therefore, treatment must be based on antibiotic susceptibility results for better outcomes in future patients. An outbreak investigation was done and microbiological testing was done on water samples, environmental samples collected from the patient's room, ventilator, and water sink and intravenous fluids, however culture yielded no growth. The factors which suggest that *C. pauculus* was pathogen in the present case was isolation of the organism from several blood culture specimens.

An infection with *Cupriavidus* is overlooked in many cases due to the low index of suspicion and awareness among microbiologists and clinicians.[15] Therefore, due consideration should be given to this organism to know the true magnitude of its infection in our country. The non-fermenters should be subjected to speciation as a part of routine microbiological work-up. To our best knowledge, this is the rare report of septicemia due to *C. pauculus* associated with duodenal perforation.

4. Conclusion

It appears that multidrug resistant *Cupriavidus* is an emerging rare pathogen in hospitalized patients. Clinicians and microbiologist needs to be vigilant. Early diagnosis and management is crucial to improve the outcome. An appropriate blood culture and automated platforms may help search for the potential pathogen timely for adequate treatment and outcome.

5. Source of Funding

None.

6. Conflict of Interest

None.

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