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Case Report

Cupriavidus Pauculus as A Cause of Late Onset Post-Operative Sinusitis

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Abstract

Cupriavidus pauculus is an environmental gram-negative bacilli of low virulence, being increasingly reported to be associated with invasive infections in immunocompromised patients and device related infections. Often undetected or misidentified in most microbiology laboratories, identification of this organism requires increased suspicion and automated identification or molecular methods. We hereby describe a curious case of post-operative acute sinusitis caused by this rare yet emerging human pathogen.

Keywords: Cupriavidus pauculus, sinusitis, immunocompromised.

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Introduction

Cupriavidus species are gram-negative, aerobic, motile, and non-spore-forming bacilli of low virulence found in soil and water causing invasive infections in immunocompromised patients or related to intravascular catheters or other devices [1, 2].

Cupriavidus pauculus was formerly known as CDC group IV c-2, Ralstonia paucula and Wautersia paucula [3, 4]. Infections caused by this organism varied from abscess, tenosynovitis, community acquired pneumonia, peritonitis, bacteremia, septicemia and meningitis [3]. Source of infection is thought be the hospital environment, i.e nebulization solutions, tap water, hydrotherapy pools, bottled mineral water, water from ultrafiltration systems, medical devices, such as extra-corporeal membrane oxygenation (ECMO) equipment and ventilators [3, 5].

Genus *Cupriavidus* contains 13 species, *C.pauculus* being implicated as the commonest cause of infections in humans, albeit rare [5]. There are case reports of infections reported by *C.pauculus* in the recent years, however, the exact prevalence of *C.pauculus* infections still remain unclear probably due to underreporting by the Clinical Microbiology laboratories. We hereby present a case of *C.pauculus* infection from a patient presenting with post-nasal discharge following septo-turbinoplasty and bilateral antrostomy.

CASE REPORT

A 36year female presented to ENT Clinic with history of increased nasal discharge for one week duration. The symptoms started initially with severe bilateral facial pain radiating to tooth at maxillary sinus location and thick greenish nasal discharge for almost two months. She was treated with medications for sinusitis, however, symptoms persisted despite multiple courses of medical therapy. As part of further investigations, CT scan was performed which showed bilateral maxillary sinusitis and right deviated nasal septum. As episodes of recurrent sinusitis were affecting patient's quality of life, and as medical therapy didn't prove useful in this case, the patient was advised for surgery.

She underwent mini FESS, septo-turbinoplasty and bilateral antrostomy 2 months back consequent to recurrent nasal block, facial pain, headache caused by deviated nasal septum leading to chronic maxillary sinusitis which was unresponsive to medical therapy. Immediate post-surgical recovery was unremarkable and no immediate complications were identified. Two months later, patient presented to the clinic with history of increased nasal discharge. Nasal swab was collected and sent to Microbiology laboratory for investigations.

Sample was processed as Pus swab as per Microbiology laboratory policy. The sample was plated on Blood, Chocolate and MacConkey agar, incubated at

37°C under aerobic conditions. After 24 hours of incubation, non-lactose fermenting, circular convex colonies with smooth surface were noted on the culture media. On prolonged incubation, colonies turned pink in color, noticeable more on Chocolate agar. Gram stain from the colonies revealed faint stained gram negative cocco-bacilli which were oxidase positive. The colonies were further processed for identification and antibiotic susceptibility testing using commercially available Vitek-2 compact system. The colonies were identified as Cupriavidus pauculus with 97% probability by Vitek-2 compact system. Since it was oxidase positive and nonlactose fermenter, antibiotic sensitivity was performed using Vitek-2 AST 292 Card. Manual susceptibility testing was simultaneously put up using Kirby Bauer disk diffusion method on Mueller Hinton agar for Aztreonam, Piperacillin Tazobactum and Ofloxacin and interpreted using CLSI 2023 guidelines applicable for Pseudomonas spp. The organism was resistant to multiple group of antibiotics including Aminoglycosides [Amikacin, Gentamycin, Tobramycin], Carbapenems [Imipenem and Meropenem], Piperacillin Tazobactum, Aztreonam and Ceftazidime. This organism exhibited susceptibility to fluoroquinolones alone – Ciprofloxacin, Levofloxacin and Ofloxacin. Patient was treated with Tavanic [oral levofloxacin] for 14 days resulting in symptom resolution.

DISCUSSION

Cupriavidus spp. are rarely encountered nonfermenting, aerobic Gram negative bacilli of low virulence and environmental origin, which can cause infections related to intravascular catheters or other immunocompromised patients, Cupriavidus pauculus being the species involved most frequently [1]. It has also been reported to cause serious infections in both immunocompromised immunocompetent patients causing hospital outbreaks. Risk factors for acquisition of Cupriavidus pauculus infections identified include oncological disease and chemotherapy, presence of central lines, end-stage renal failure and the need of dialysis, congestive heart failure and primary immunodeficiency. Misidentification by the automated identification unavailability of the same could be the reason for the reported low incidence of *Cupriavidus* infections [1, 7].

The source of the micro-organism remains indeterminate in many cases as is in our patient. Where the source of infection could be identified, it was traced to contaminated water source including hydrotherapy pools, nebulizing solutions and even bottled mineral water [8]. Water borne infections and outbreaks in hospitals caused by *Legionella* and *Pseudomonas spp* are well known and infection prevention measures are well established [9]. However, the presented case and similar reports from the literature highlight the importance of emerging pathogens from hospital water source capable

of causing invasive infections in immunocompromised patients and in postoperative settings [10].

Since *Cupriavidus pauculus* is known to be of low virulence and of environmental origin, infection could presumably have been acquired during surgery or during wound dressing by patient at home with water and the organism's low virulence could explain the delay in symptom development in our case (2 months post surgery).

The majority of reported *C. pauculus* infections recovered with antibiotic treatment similar to the patient reported here. The sensitivity of the micro-organism has been described, with a known usual sensitivity to high spectrum beta-lactams, trimethoprim/sulfamethoxazole and quinolones, however, in our patient, this isolate exhibited sensitivity only to fluoroquinolones [7]. So far, no deaths have been attributed directly to the organism, however, deaths occurred have been attributed to comorbidities associated with *Cupriavidus* infections.

C. pauculus was not identified in any other samples from the patient subsequent to this isolation. The patient did not have history of any devices inserted during her previous hospitalization and had never been admitted to the Intensive Care Unit. We did not pursue environmental cultures as this was an isolated case and no further cases were identified subsequently.

There are very few cases reported in the literature, approximately less than 40 cases worldwide and this makes our case report timely and noteworthy as it brings to light yet another instance of infection caused by this rare pathogen in an entirely different (post-operative) setting.

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