

CASE REPORTS

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Aerococcus viridans pyelonephritis in a young age female patient with type 1 diabetes mellitus: a rare case report

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Abstract

Background: *Aerococcus* species are Gram-positive cocci, with negative catalase and oxidase activities and growth characteristics similar to viridans streptococci. They rarely cause infection in humans. However, there are reports of bacteremia, meningitis, septic arthritis, and endocarditis due to this pathogen in the literature. Herein we report a rare case of pyelonephritis due to *A. viridans*.

Case presentation: A 31-year-old-female patient with type 1 diabetes mellitus was presented with left loin pain, fever, nausea, and anorexia for 3 days. She had a history of obstructive nephropathy due to sloughed necrotic papillae 3 months earlier, mandating bilateral JJ stent insertion. She was treated with a 2 weeks course of doxycycline (100 mg, twice daily) based on the antibiotic susceptibility profile of her urine culture and responded well.

Conclusion: This case highlights the possibility of complicated urinary tracts infection due to a rare human pathogen.

Keywords: Pyelonephritis, Type 1 diabetes mellitus, Rare UTI, *Aerococcus viridans*

1 Background

Pyelonephritis is a renal tubulointerstitial infection that causes inflammation of the renal pelvis and parenchyma, resulting from bacteriuria and with the consequence of renal scarring. Nephropathy is a major complication of type 1 (insulin-dependent) diabetes mellitus [1]. Patients with uncontrolled hyperglycemia have an increased susceptibility to infection, with the urinary tract being the second most frequent site having an incidence of 12.9% in females and 3.9% in males [2, 3]. Urinary tract infection (UTI) is one of the most common human infections

that can cause critical morbidity and subsequent mortality [4].

In diabetic pyelonephritis, the most common pathogens usually belong to the family Enterobacteriaceae, whereas UTIs due to Gram-positive bacteria are less common but remain important [5, 6]. The *Aerococcus* spp. are rarely implicated as pathogens in humans and can cause an invasive and diverse spectrum of infections. However, they have low virulence and are mostly pathogenic in patients who are in vulnerable conditions [7]. *A. viridans* is a microaerophilic Gram-positive coccus, first described in 1953, with negative catalase and oxidase activities, α -hemolytic features, and only highly rarely implicated in UTI [8, 9]. The organism has many growth characteristics similar to enterococci and streptococci, thus routinely misidentified as α -hemolytic streptococci [10]. This study

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emphasizes the unusual occurrence of isolated *A. viridans* pyelonephritis in a young female patient with type 1 diabetes mellitus.

2 Case presentation

A 31-year-old married female patient with type 1 diabetes mellitus was presented with left loin pain, fever, nausea, and anorexia for the last three days. Further questioning revealed a history of poorly controlled diabetes and recurrent urinary tract infections. Four months prior, she underwent emergency bilateral ureteroscopy for bilateral obstructive nephropathy (serum creatinine 8.4 mg/dL and blood urea 160 mg/dL) resulting from ureteral obstruction secondary to sloughed renal papillae. She was discharged with a baseline serum creatinine of 1.4 mg/dL and advised to observe a low-protein and -carbohydrate diet. On presentation, she had tachycardia (110 BPM), tachypnea (22 cycles/min), fever (39.4 °C), and normal blood pressure. An abdominal examination revealed a soft abdomen, but she had a tender left loin. Blood investigations showed leukocytosis, blood urea 57 mg/dL, serum creatinine 2.5 mg/dL, and CRP 415 mg/dL. US scan showed bilateral grade 1 increased parenchymal echogenicity with left pelvicalyceal dilatation and urothelial thickening. Microscopic analysis of the urine sample revealed pyuria and bacteriuria. Urine culture demonstrated significant growth of Gram-positive cocci with negative catalase and oxidase activities (10^5 CFU, colony-forming unit). The isolate was subjected to identification using the fully automated instrument BD Phoenix™ M50, USA yielding *A. viridans*. Antibiotic susceptibility testing was performed using the Kirby–Bauer disc diffusion method following the susceptibility guidelines of the National Committee for Clinical Laboratory Standards Institute (CLSI) and the European Committee on Antimicrobial Susceptibility Testing (EUCAST) [11, 12]. The isolate was sensitive to tetracycline, doxycycline, and clindamycin but resistant to levofloxacin, ciprofloxacin, norfloxacin, penicillin, piperacillin, erythromycin, trimethoprim-sulfamethoxazole, cefepime, and cefotaxime. After sending the urine sample for culturing, the patient was admitted and treated with intravenous fluid, analgesics, empiric meropenem (500 mg, twice daily), and insulin according to the blood glucose level. She responded to the medical management and was discharged home after three days on oral doxycycline (100 mg, twice daily). The new urinalysis showed normal parameters two weeks later, and her serum creatinine was 1.4 mg/dL. Since then, she has been under close observation.

3 Discussion

Diabetes mellitus is a common cause of bacteriuria, cystitis, pyelonephritis, rare complicated UTIs, and renal papillary necrosis [13]. Bilateral pyelonephritis has predominantly been seen among diabetic patients. Obstructive nephropathy causes high intrapelvic pressure in the kidney and subsequent sepsis resulting from biofilm formation by the causative microorganisms. It is a severe condition requiring emergency medical attention from nephrologists [14]. Ultrasonography is the initial diagnostic imaging tool used in patients with pyelonephritis [15]. The ultrasound of the current case revealed bilateral grade one increased parenchymal echogenicity with left pelvicalyceal dilatation and urothelial thickening.

Classic associated symptoms of pyelonephritis include fever, chills, and unilateral or bilateral flank pain with common laboratory findings of pyuria, leukocytic casts, positive urine culture, raised inflammatory markers, and leukocytosis with a neutrophilic shift [16]. The current case had poor glycemic control with the classic symptoms of upper urinary tract infection such as fever, nausea, and anorexia, and the laboratory findings of pyuria, leukocytosis, and elevation of C-reactive protein as markers of inflammation.

Increasingly, rare and antibiotic-resistant microorganisms are found as the causative agents of UTIs in diabetic patients [14]. We isolated the *A. viridans* strain in significant numbers ($>10^5$ CFU/mL) from the urine culture of the current case.

A. viridans are Gram-positive cocci, and the microscopic appearance shows arranged tetrads and irregular clusters. This appearance is similar to that of staphylococci, while the growth characteristics of the organism are similar to those of streptococci and enterococci, often leading to incorrect diagnosis [8]. Apart from *A. viridans*, the first subspecies of *Aerococcus*, two other subspecies were later isolated as rare human pathogens causing infective endocarditis and urinary tract infections, named *A. urinae* and *A. sanguinicola* [7]. According to the available literature, the first reported case of *A. viridans* bacteremia was in Korea [9].

The pathogenicity and virulence of *A. viridans* have not been fully described. Infections by this organism are seemingly due to previously damaged tissue or nosocomial in origin due to prolonged hospitalization, invasive procedures, neutropenic and diabetic states, or antibiotic treatment [9]. Mohan et al. reported the first case of *A. viridans* in nosocomial UTI in India [17].

Antimicrobial susceptibility patterns reveal a guide for choosing appropriate antibiotic treatment. Studies from clinical cases and specimens have demonstrated that *Aerococcus* spp. is generally susceptible to β -lactam antimicrobials (penicillin, ampicillin,

amoxicillin-clavulanic acid), and vancomycin, as well as other groups of antibiotics [18, 19]. Schuur et al. reported that 100% of all the *Aerococcus* spp. were susceptible to penicillin, amoxicillin, and nitrofurantoin [20]. In contrast, Augustine et al. reported a case of endocarditis caused by *A. viridans* that was resistant to penicillin, ampicillin, cefotaxime, and quinolones [21]. This agrees with the current case, as the isolated *A. viridans* strain was susceptible to tetracycline, doxycycline, and clindamycin while being resistant to levofloxacin, ciprofloxacin, norfloxacin, penicillin, piperacillin, erythromycin, trimethoprim-sulfamethoxazole, cefepime, and cefotaxime.

4 Conclusion

Despite the rare implication of *A. viridans* in human infections, the organism is capable of causing severe UTIs, with several penicillin-resistant strains that can complicate the infection further, especially in diabetic patients.

Abbreviations

UTI: Urinary tract infection; CLSI: Clinical Laboratory Standards Institute; EUCAST: European Committee on Antimicrobial Susceptibility Testing.

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Author contributions

"AS" conceived and designed the manuscript. "RB" and FK drafted the manuscript. "SA", "KH", "KM", "RA", "DH", "MM", "BA" and "RS" critically reviewed, revised, and approved the manuscript. All authors have read and approved the manuscript and agreed to the submission.

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Competing interests

The authors declare that they have no competing interests.

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