

Oral Therapy for *Aerococcus urinae* Bacteremia and Thoracic Spondylodiscitis of Presumed Urinary Origin

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Background: *Aerococcus urinae* (*A urinae*), considered a rare pathogen, has been identified with increasing frequency in urine cultures. Only 8 cases of spondylodiscitis due to *A urinae* have been reported. Optimal treatment for invasive *A urinae* infection is undefined. However, the reported cases were treated successfully with diverse antibiotic regimen combinations, all including a β -lactam and beginning with at least 2 weeks of IV antibiotics.

Case Presentation: A 74-year-old man presented to the emergency department after 2 weeks of midthoracic back pain, lower extremity weakness, gait imbalance, fatigue, anorexia, rigors, and subjective fevers. The patient was

presumed to have discitis secondary to a urinary tract infection with possible pyelonephritis and was given empiric vancomycin and ceftriaxone. Spinal magnetic resonance imaging with contrast supported spondylodiscitis. Preliminary results from the admission blood and urine cultures showed gram-positive cocci in clusters.

Conclusions: *A urinae* urinary tract infection in the absence of obvious predisposing factors should prompt evaluation for urinary outflow obstruction. We suspect a review of a US Department of Veterans Affairs population might uncover a higher incidence of *A urinae* infection than previously suspected.

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A *aerococcus urinae* (*A urinae*), a gram-positive coccus readily mistaken for a *Staphylococcus* species, was first identified in 1992.¹⁻³ It now reportedly accounts for 0.2% to 0.8% of clinical urine isolates.⁴⁻⁶ *A urinae* bacteriuria is typically asymptomatic and mainly occurs in women.⁷⁻⁹ Symptomatic *A urinae* urinary tract infection (UTI) occurs predominantly in older men with underlying urologic abnormalities.⁴⁻¹⁰

Serious *A urinae* infections are rare. The first 2 reported cases involved men with *A urinae* endocarditis, one of whom died.^{11,12} To date, only 8 cases of spondylodiscitis due to *A urinae* have been reported.¹³⁻²⁰ Optimal treatment for invasive *A urinae* infection is undefined; however, the reported cases were treated successfully with diverse antibiotic regimen combinations; all including a β -lactam and beginning with at least 2 weeks of IV antibiotics.¹³⁻²⁰ We describe a man with *A urinae* bacteremia and spondylodiscitis, presumably arising from a urinary source in the setting of bladder outlet obstruction, who was treated successfully.

CASE PRESENTATION

A 74-year-old man with morbid obesity, type 2 diabetes mellitus, stage 2 chronic kidney disease, and tobacco use presented to the emergency department after 2 weeks of progressive, nonradiating, midthoracic back

pain, lower extremity weakness, gait imbalance, fatigue, anorexia, rigors, and subjective fevers. On presentation, he was afebrile and hemodynamically stable. A physical examination revealed point tenderness of the midthoracic vertebrae, nontender costovertebral angles, diffusely decreased strength, non-sustained clonus in both lower extremities, inguinal intertrigo, and a buried penis with purulent meatal discharge.

Laboratory results indicated a white blood cell (WBC) count of 13.5 K/ μ L (reference range, 4.0-11.0), absolute neutrophil count of 11.48 K/ μ L (reference range, 2.0-7.7), C-reactive protein (CRP) level of 225.3 mg/L (reference range, \leq 5.0), erythrocyte sedimentation rate of 85 mm/h (reference range, 5-15), serum blood urea nitrogen of 76 mg/dL (reference range, 8-26), and serum creatinine (SCr) of 1.9 mg/dL (reference range, 1.1-1.4). A urinalysis showed positive leukocyte esterase, WBC clumps, and little bacteria. Abdominal/pelvic computed tomography showed spondylodiscitis-like changes at T7-T8, bilateral perinephric fat stranding, bladder distension, and bladder wall thickening.

The patient was presumed to have discitis secondary to a UTI, with possible pyelonephritis, and was given empiric vancomycin and ceftriaxone. Spinal magnetic resonance imaging with contrast supported

spondylodiscitis at T7-T8, extending to T8-T9. Preliminary results from the admission blood and urine cultures showed gram-positive cocci in clusters, which were presumed initially to be *Staphylococcus aureus* (*S aureus*).

The final urine culture report listed multiple organisms, predominantly *A urinae* (Table 1); whereas the final blood culture result was *A urinae* in all 4 bottles (2 aerobic, 2 anaerobic). Whereas the blood isolate was susceptible to all 6 tested agents, the *A urinae* urine isolate was susceptible to meropenem and vancomycin but intermediate to penicillin and ceftriaxone and resistant to levofloxacin (Table 2). Transthoracic echocardiography, which was limited by body habitus, showed no vegetations or other valvular abnormalities. The patient declined transesophageal echocardiography. Repeat blood cultures from day 3 were negative.

On hospital day 6, the patient's back pain had resolved, micturition was normal, appetite had normalized, and SCr was minimally above baseline (1.4 mg/dL). He insisted on completing antibiotic treatment at home and had no other medical indication for continued hospitalization. Thus, antibiotic therapy was changed to an all-oral regimen of amoxicillin 1 g 3 times daily for 10 days and levofloxacin 750 mg daily for 6 weeks, and the patient was discharged to home.

The patient returned 5 days postdischarge due to anuria. Investigation showed severe acute kidney injury (SCr, 6.8 mg/dL) and bladder outlet obstruction due to phimosis and urethral meatal stenosis. Urinalysis was unremarkable. His CRP had declined from 225 mg/L (initial admission) to 154 mg/L. *A urinae* culture and 2 sets of blood cultures were finalized as no growth. He was diagnosed with postrenal acute kidney injury and underwent meatal dilation and Foley catheterization but declined surgical correction. When seen in the clinic 2 months postantimicrobial therapy, the patient had normal micturition, no symptoms or signs of infection, and steadily down-trending inflammatory markers.

DISCUSSION

A urinae, historically considered a rare pathogen, has been identified with increasing frequency in urine cultures due to

TABLE 1 Urine Culture Results

Organisms	Quantity, CFUs/mL
<i>Aerococcus urinae</i>	> 100,000
Gram-negative rods ^a	
First organism	50,000
Second organism	50,000
Third organism	30,000
Gram-positive rods ^a	30,000

^aMorphologically distinct organisms not specified.

improved microbiologic diagnostic techniques. However, there are only 8 reported cases of *A urinae* spondylodiscitis. Urinary pathology is an accepted risk factor for *A urinae* infections; consequently, we suspect that our patient's urinary outflow obstruction and poor genitourinary hygiene were related to his invasive *A urinae* infection.^{10,21,22} We surmise that he had a chronic urinary outflow obstruction contributing to his infection, as evidenced by imaging findings, while the phimosis and urethral meatal stenosis were most likely infectious sequelae considering his anuria and acute kidney injury 5 days postdischarge. Indeed, the correlation between *A urinae* and urinary tract pathology may justify an evaluation for urinary pathology in any man with *A urinae* infection, regardless of the presence of symptoms.

By contrast, the implications of *A urinae* bacteriuria remain unclear. From a public health perspective, *A urinae* bacteriuria is rare, but the infectious mechanism remains undetermined with a case report suggesting the possibility of sexual transmission.^{4-6,23} In our case, the patient was not sexually active and had no clear origin of infection. Considering the potential severity of infection, more studies are needed to determine the infectious mechanism of *A urinae*.

In terms of infectious morbidity, the results seem to vary by sex. In a retrospective study of about 30,000 clinical urine samples, 62 (58 from women, 4 from men) yielded *A urinae*. The 62 corresponding patients lacked systemic infectious complications, leading the authors to conclude that *A urinae* is a relatively avirulent organism.²⁴ Although possibly true in women, we are wary of drawing

TABLE 2 *Aerococcus urinae*
Antimicrobial Susceptibility Profile

Antibiotics	Susceptibility results	
	Urine isolate	Blood isolate
Penicillin G	Intermediate	Sensitive
Ceftriaxone	Intermediate	Sensitive
Meropenem	Sensitive	Sensitive
Levofloxacin	Resistant	Sensitive
Vancomycin	Sensitive	Sensitive

conclusions, especially regarding men, from a study that included only 62 urine samples were *A urinae*-positive, with only 4 from men. More evidence is needed to define the prognostic implications of *A urinae* bacteriuria in men.

As illustrated by the present case and previous reports, severe *A urinae* infections can occur, and the contributory factors deserve consideration. In our patient, the actual mechanism for bacteremia remains unclear. The initial concern for acute pyelonephritis was prompted by a computed tomography finding of bilateral perinephric fat stranding. This finding was questioned because it is common in older patients without infection, hence, is highly nonspecific. A correlation with urinary outflow obstruction may be an important clue in cases like this one.^{25,26}

Furthermore, whether the urinary tract truly was the source of the patient's bacteremia is clouded by the differing antimicrobial susceptibility patterns of the *A urinae* blood and urine isolates. The simplest explanation for this discordance may be that all the isolates shared a common initial origin but adapted to different environments in the host (perhaps over time) or laboratory, producing phenotypic variation. Alternatively, the infection could have been polyclonal from the onset, with sampling error leading to the differing detected susceptibility patterns, or the blood and urine isolates may have represented independent acquisition events, involving distinct *A urinae* strains. Unfortunately (from an academic perspective), given patient preferences and recommendations from the infectious disease consultant, no bone biopsy was done for histology and culture to con-

firm infection and to allow comparative strain identification if *A urinae* was isolated.

Optimal treatment for *A urinae* spondylodiscitis has yet to be established. β -lactams have shown good clinical efficacy despite being bacteriostatic in vitro.²⁷ Early in vitro studies showed synergistic bactericidal synergistic activity with penicillin plus aminoglycoside combination therapies.²⁷⁻³⁰ Cases of endocarditis have been successfully treated mainly with the combination of a β -lactam plus aminoglycoside combination therapy.^{30,31} Previous cases of spondylodiscitis have been treated successfully with diverse antimicrobial agents, including clindamycin, β -lactams, cephalosporins, fluoroquinolones, and aminoglycosides.¹⁴

Our patient improved rapidly while receiving empiric therapy with vancomycin and ceftriaxone and tolerated a rapid transition to oral amoxicillin and levofloxacin. This is the shortest IV treatment course for *A urinae* spondylodiscitis reported to date. We suspect that such rapid IV-to-oral transitions will suffice in most stable patients with *A urinae* spondylodiscitis or other invasive *A urinae* infections in line with the results of the OVIVA and POET trials.^{32,33}

CONCLUSIONS

We believe *A urinae* UTI in the absence of obvious predisposing factors should prompt evaluation for urinary outflow obstruction. Despite improved laboratory diagnostic techniques, spondylodiscitis related to *A urinae* remains a rare entity and thus definitive treatment recommendations are difficult to make. However, we suspect that in many cases it is reasonable to extrapolate from the results of the POET and OVIVA trials and rapidly transition therapy of *A urinae* spondylodiscitis from IV to oral antibiotics. We suspect a review of the US Department of Veterans Affairs population might uncover a higher incidence of *A urinae* infection than previously estimated due to the population demographics and the epidemiology of *A urinae*.

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Ethics and consent

Verbal informed consent for publication was obtained from the patient. All identifying patient information has been removed to protect patient privacy.

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