



Case report

Prosthetic valve endocarditis caused by *Aerococcus Urinae*Reba Varughese^{a,*}, Achshah Mathew^b, Rishi Chadha^a, Julia Kostka^a, David Regelmann^a^a Department of Internal Medicine, Quinnipiac University Frank H. Netter MD School of Medicine/St. Vincent's Medical Center, Bridgeport, CT, USA^b Pushpagiri Institute of Medical Sciences and Research Centre, Medicine, Tiruvalla, Kerala, India

ARTICLE INFO

Article history:

Received 24 June 2020

Received in revised form 12 July 2020

Accepted 12 July 2020

Keywords:

Aerococcus urinae

Infective endocarditis

Bacteremia

ABSTRACT

Infective endocarditis (IE) caused by *Aerococcus urinae* is rare. The true incidence rate of this pathogen is likely underestimated as this is easily misidentified as *Staphylococci* or *Streptococci*. It is also associated with increased risk of complications such as systemic emboli. *Aerococcus* usually affects elderly males with underlying urological conditions. Here we present a case of IE with this rare *Aerococcus urinae* in a young man with a bioprosthetic aortic valve, despite negative urine cultures.

© 2020 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Aerococcus urinae was first described as an *Aerococcus*-like organism (ALO) in 1967 [1]. It was recognized as the newly emerging urinary pathogen that caused local and systemic urinary tract infection in 1991 [2] and was subsequently described as *Aerococcus urinae* in 1992 [3]. *A. urinae* accounts for approximately 0.2–0.8% of all cases of urinary tract infections (UTI) [4]. Invasive infections by *A. urinae* are infrequent, of which IE is the most commonly reported disseminated *aerococcal* bacteremia. This complication occurs in 0.5–3 cases per 1 million people per year [5,6]. Less than 50 cases of *A. urinae* IE have been reported in literature [7] of which prosthetic valve involvement is exceedingly rare, primarily due to misidentification as *Streptococci* or *Staphylococci* species. It has been reported as one of the causes of culture negative IE [9]. Other conditions associated with *A. urinae* include lymphadenitis, soft tissue infections in genital area, peritonitis in peritoneal dialysis patients, postpartum infections and joint infections [4,5].

Case presentation

A 43-year-old morbidly obese man with past medical history of uncontrolled type 2 diabetes mellitus, fungal endocarditis status post aortic valve replacement with bioprosthetic valve and tricuspid valve replacement, heart failure with reduced ejection fraction (30–35%), grade I diastolic dysfunction, atrial fibrillation,

non-ischemic cardiomyopathy with biventricular pacemaker and automated implantable cardioverter defibrillator (AICD), and chronic kidney disease (CKD) secondary to diabetic nephropathy was admitted with sepsis secondary to UTI and an episode of syncope. Of note, the patient was not adherent to his prescribed medication regimen, and his past history was negative for urological abnormalities. His physical examination was remarkable only for obesity class III, no cardiopulmonary distress and bilateral 2+ pitting pedal edema.

Laboratory findings were notable for leukocytosis, elevated creatinine levels and elevated troponin. His urine was cloudy, though he denied urinary symptoms. After collection of blood and urine cultures, he received empiric antibiotic therapy with vancomycin and cefepime. Transesophageal echocardiogram revealed a well-seated bioprosthetic aortic valve with a large mobile vegetation measuring 1cmx0.6cm. His urine cultures showed no growth during the hospital course. Blood cultures initially speciated as *Granulicatella adiacens* within two days of admission. Two weeks later, the culture confirmed the growth of rare *Aerococcus urinae*. The patient met Duke's criteria for diagnosis of IE, with both major criteria (positive blood cultures and echo cardiac evidence of vegetation) and minor criteria of fever and underlying heart condition [10]. No other immunologic or vascular features were noted. The antibiotics were deescalated to ceftriaxone and vancomycin, which were continued during his hospital stay. Cardiac catheterization showed diffuse left anterior descending artery stenosis, requiring CABG. Hospital course was complicated by worsening acute CKD that was attributed to acute tubular necrosis (ATN) and required hemodialysis. Given the patient's underlying complicated medical background, he was considered high risk for cardiac surgery and was treated successfully with intravenous antibiotics.

* Corresponding author.

E-mail addresses: rebava@live.com (R. Varughese), achshah.danny@gmail.com (A. Mathew), Rishi.chadha@hhchealth.org (R. Chadha), Julia.kostka@hhchealth.org (J. Kostka), David.regelmann@hhchealth.org (D. Regelmann).

Discussion

Aerococcus urinae is a catalase negative, alpha hemolytic gram positive coccus, with forming colonies arranged in clusters or tetrads on blood agar. Often, the organism is misidentified as *Streptococci* or *Staphylococci*. It resembles microscopic characteristics of *Staphylococci*, biochemical, growth characteristics and hemolysis pattern of *Streptococci* and the antibiotic resistance patterns of enterococci [5,11]. Moreover, isolates of *A. urinae* have been wrongly assigned as *Granulicatella adiacens* [12]. Hence, the true incidence is underestimated.

The normal habitat of pathogenic *aerococci* is unknown, but the organism is considered part of the normal flora of the urinary tract [13]. Potential virulence mechanisms for *Aerococcus* include platelet aggregation and biofilm formation [14], both of which are considered in the pathophysiology behind *A. urinae* associated IE. *Aerococcus* species were rarely suspected to cause human disease and were usually considered as contaminants in clinical cultures from non-sterile sites [15].

A. urinae UTI often affects the elderly (age >65 years old), men and those with existing urological pathologies, such as prostatic hyperplasia, urethral stricture, renal calculi, and prior urinary tract surgery [5,16]. Many patients also have underlying comorbidities such as diabetes, heart disease, dementia and chronic renal failure [21]. This case of *A. urinae* IE involved a patient who was unusually young with no underlying urological abnormalities with uncontrolled diabetes as an underlying comorbidity. The most commonly involved valve in *A. urinae* is the aortic valve followed by mitral valve [11]. The mortality is reported to be high due to a significant incidence of embolic events. Cardiogenic shock, septic emboli, stroke, renal failure and disseminated intravascular coagulation are other complications [17]. Aortic wall ulceration is also a complication of *A. urinae* IE [18]. Hence, timely diagnosis and appropriate management is essential to prevent severe mortality and morbidity.

16S ribosomal RNA gene sequencing is the gold standard for accurate identification of *Aerococcus*, but this technique is costly, time-consuming, and impractical for most diagnostic clinical microbiology labs [19]. With improvement in diagnostic methods, especially matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS), *Aerococcus* has been increasingly recognized as a human pathogen. MALDI-TOF MS is rapid, accurate, and has demonstrated good sensitivity and specificity in identifying *aerococci* [20].

Despite the fact that *A. urinae* is a rare organism causing IE, most cases respond well to antibiotic therapy, and surgery is often not needed [16]. No definite treatment recommendations for either dosage or duration are mentioned in the literature. *A. urinae* is almost always sensitive to penicillin, ampicillin, carbapenem and aminoglycosides [4]. Based on the literature review, patients with endocarditis on native valves should be treated with intravenous penicillin for at least 4 weeks in combination with an aminoglycoside for at least the first 14 days with monitoring of clinical and laboratory results [21]. Aminoglycosides should be cautiously used due to their side effect profile, especially in elderly patients. Due to high mortality, extending the combination antibiotic therapy to 6 weeks might be reasonable. Such an extended course must uniformly be the practice in cases of prosthetic valve IE. In cases with penicillin allergy, clinicians may use vancomycin or daptomycin along with gentamicin [22,23].

The indications for surgical intervention for prosthetic valve endocarditis include severe prosthetic valve dysfunction, severe heart failure, large vegetation, and abscess or perivalvular involvement [24,25].

Conclusion

IE caused by *Aerococcus urinae* can present with complications even without any typical peripheral manifestations. Clinicians will benefit their patients by careful consideration of this diagnosis and by maintaining a wide differential when treating patients with valve replacement admitted with sepsis. Such practice will facilitate early diagnosis and appropriate treatment, to prevent significant morbidity and mortality.

CRedit authorship contribution statement

Reba Varughese: Writing - original draft. **Achshah Mathew:** Writing - original draft. **Rishi Chadha:** Writing - review & editing. **Julia Kostka:** Writing - review & editing. **David Regelman:** Writing - review & editing.

References

- Colman G. *Aerococcus*-like organisms isolated from human infections. *J Clin Pathol* 1967;20(3):294–7, doi:http://dx.doi.org/10.1136/jcp.20.3.294.
- Christensen JJ, Vibits H, Ursing J, Korner B. *Aerococcus*-like organism, a newly recognized potential urinary tract pathogen. *J Clin Microbiol* 1991;29(5):1049–53.
- Aguirre M, Collins MD. Phylogenetic analysis of some *Aerococcus*-like organisms from urinary tract infections: description of *Aerococcus urinae* sp. nov. *J Gen Microbiol* 1992;138:401–5, doi:http://dx.doi.org/10.1099/00221287-138-2-401.
- Rasmussen M. *Aerococcus*: an increasingly acknowledged human pathogen. *Clin Microbiol Infect* 2016;22(1):22–7, doi:http://dx.doi.org/10.1016/j.cmi.2015.09.026.
- Rasmussen M. *Aerococci* and *aerococcal* infections. *J Infect* 2013;66(6):467–74, doi:http://dx.doi.org/10.1016/j.jinf.2012.12.006.
- Senneby E, Petersson AC, Rasmussen M. Epidemiology and antibiotic susceptibility of *aerococci* in urinary cultures. *Diagn Microbiol Infect Dis* 2015;81(2):149–51, doi:http://dx.doi.org/10.1016/j.diagmicrobio.2014.11.009.
- Yabes JM, Perdakis S, Graham DB, et al. A rare case of *Aerococcus urinae* infective endocarditis in an atypically young male: case report and review of the literature. *BMC Infect Dis* 2018;18:522, doi:http://dx.doi.org/10.1186/s12879-018-3414-0.
- Slany M, Freiburger T, Pavlik P, Cerny J. Culture-negative infective endocarditis caused by *Aerococcus urinae*. *J Heart Valve Dis* 2007;16(March (2)):203–5.
- Li JS, Sexton DJ, Mick N, et al. Proposed modifications to the Duke criteria for the diagnosis of infective endocarditis. *Clin Infect Dis* 2000;30(4):633–8, doi:http://dx.doi.org/10.1086/313753.
- Christensen JJ, Jensen IP, Faerk J, Kristensen B, Skov R, Korner B. Bacteremia/septicemia due to *Aerococcus*-like organisms: report of seventeen cases. Danish ALO Study Group. *Clin Infect Dis* 1995;21(4):943–7, doi:http://dx.doi.org/10.1093/clinids/21.4.943.
- Senneby E, Petersson AC, Rasmussen M. Clinical and microbiological features of bacteraemia with *Aerococcus urinae*. *Clin Microbiol Infect* 2012;18(6):546–50.
- Hilt EE, McKinley K, Pearce MM, et al. Urine is not sterile: use of enhanced urine culture techniques to detect resident bacterial flora in the adult female bladder. *J Clin Microbiol* 2014;52(3):871–6, doi:http://dx.doi.org/10.1128/JCM.02876-13.
- Shannon O, Mörgelin M, Rasmussen M. Platelet activation and biofilm formation by *Aerococcus urinae*, an endocarditis-causing pathogen. *Infect Immun* 2010;78(10):4268–75, doi:http://dx.doi.org/10.1128/IAI.00469-10.
- Yasukawa K, Afzal Z, Mbang P, Stager CE, Musher DM. *Aerococcal* infection at three US tertiary care hospitals. *South Med J* 2014;107(10):642–7, doi:http://dx.doi.org/10.14423/SMJ.0000000000000158.
- Sunnerhagen T, Nilson B, Olaison L, Rasmussen M. Clinical and microbiological features of infective endocarditis caused by *aerococci*. *Infection* 2016;44(2):167–73, doi:http://dx.doi.org/10.1007/s15010-015-0812-8.
- Adomavicius D, Bock M, Vahl CF, Siegel E. *Aerococcus urinae* mitral valve endocarditis-related stroke: a case report and literature review. *J Investig Med High Impact Case Rep* 2018;6:2324709618758351, doi:http://dx.doi.org/10.1177/2324709618758351 Published 2018 Feb 25.
- Ludhwani D, Li J, Huang EE, Sikora A, Thomas G. *Aerococcus urinae* aortic valve endocarditis with kissing aortic wall ulcer: a case report and literature review. *Am J Case Rep* 2020;21, doi:http://dx.doi.org/10.12659/AJCR.920974 e920974. Published 2020 May 21.
- Opota O, Prod'homme G, Andreutti-Zaugg C, et al. Diagnosis of *Aerococcus urinae* infections: importance of matrix-assisted laser desorption ionization time-of-flight mass spectrometry and broad-range 16S rDNA PCR. *Clin Microbiol Infect* 2016;22(1):e1–2, doi:http://dx.doi.org/10.1016/j.cmi.2015.08.026.
- Senneby E, Nilson B, Petersson AC, Rasmussen M. Matrix-assisted laser desorption ionization-time of flight mass spectrometry is a sensitive and

- specific method for identification of aerococci. *J Clin Microbiol* 2013;51(4):1303–4, doi:<http://dx.doi.org/10.1128/JCM.02637-12>.
- [21] Christensen JJ, Skov R. *Aerococcus urinae*. Antimicrobial therapy and vaccines. second edition 2006.
- [22] Skov R, Christensen JJ, Korner B, Frimodt-Møller N, Espersen F. In vitro antimicrobial susceptibility of *Aerococcus urinae* to 14 antibiotics, and time-kill curves for penicillin, gentamicin and vancomycin. *J Antimicrob Chemother* 2001;48(5):653–8, doi:<http://dx.doi.org/10.1093/jac/48.5.653>.
- [23] Hirzel C, Hirzberger L, Furrer H, Endimiani A. Bactericidal activity of penicillin, ceftriaxone, gentamicin and daptomycin alone and in combination against *Aerococcus urinae*. *Int J Antimicrob Agents* 2016;48(3):271–6, doi:<http://dx.doi.org/10.1016/j.ijantimicag.2016.05.007>.
- [24] Habib G, Tribouilloy C, Thuny F, et al. Prosthetic valve endocarditis: who needs surgery? A multicentre study of 104 cases. *Heart* 2005;91(7):954–9, doi:<http://dx.doi.org/10.1136/hrt.2004.046177>.
- [25] Tathireddy H, Settypalli S, Farrell JJ. A rare case of *Aerococcus urinae* infective endocarditis. *J Community Hosp Intern Med Perspect* 2017;7(2):126–9, doi:<http://dx.doi.org/10.1080/20009666.2017.1314072> Published 2017 Jun 6.