**Gardnerella vaginalis** Bacteremia in Male Patients: A Case Series and Review of the Literature

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**Gardnerella vaginalis** colonization and invasive disease of the genitourinary tract in women has been well described. In men, this organism uncommonly causes infection, and bacteremia is rare. We describe 2 cases of **G vaginalis** bacteremia in men and present a review of the literature.

Our 2 patients each had underlying comorbid conditions that predispose to serious bacterial infection. One presented with symptoms of urinary tract infection, the other presented with sepsis. Urine, cultured under usual aerobic conditions, was negative in both cases, but blood cultures after prolonged incubation yielded **G vaginalis**. Treatment with antibiotics was successful in both cases. Our review of the medical literature revealed 12 previously reported cases of **G vaginalis** bacteremia in men. Almost all infections in men have originated in the genitourinary tract. Three patients had no reported history of or evidence for disease of the urinary tract, one each with endocarditis, empyema, and odontogenic abscess.

Isolation and identification of **G vaginalis** is often delayed. Selection and duration of treatment have ranged widely in previously reported cases, likely due to the absence of reports on antibiotic susceptibility of **G vaginalis** and a lack of guidance regarding effective treatment.

**Keywords.** bacteremia; **Gardnerella vaginalis**; male.

**Gardnerella vaginalis** is a known colonizer of the female genitourinary tract and can cause serious morbidity as a pathogen, especially after gynecologic procedures or obstetric complications [1, 2]. However, **G vaginalis** is an uncommon cause of infection in men, and, in men, bacteremia with this organism is rare. We now describe 2 cases of **G vaginalis** bacteremia in male patients.

Our review of the English literature disclosed only 12 previous cases of bacteremia in men due to this organism. In the present study, we review the clinical and laboratory features of these 14 cases.

**CASE 1**

A 52-year-old man with poorly controlled type 2 diabetes and a history of nephrolithiasis presented to the emergency department for 1 month of dysuria. He also reported hematuria, left-sided flank pain, sandy urine sediment, and a gritty sensation whilevoiding. He had previously required a left percutaneous nephrostomy and ureteral stent placement for obstructive nephrolithiasis and had received extracorporeal shock wave lithotripsy more than 2 years before presentation.

On presentation he was febrile and tachycardic with left costovertebral angle tenderness. His white blood cell (WBC) count was $14.5 \times 10^9$ cells/L, creatinine 1.22 mg/dL, and blood glucose 293 mg/dL. Urinalysis revealed glucosuria, hematuria and pyuria. Urine and blood cultures were collected. Computed tomography of the abdomen and pelvis with contrast revealed left perinephric fat stranding, mild hydronephrosis, and a small calculus of the proximal left ureter.

He was treated empirically with ceftriaxone and then piperacillin-tazobactam. A left percutaneous nephrostomy was placed on the second day of hospitalization, followed by rapid clinical improvement. Aerobic culture of the urine from admission yielded <10000 colony-forming units/mL mixed Gram-positive flora. On hospital day 3, 2 blood cultures from admission yielded Gram-positive rods in anaerobic bottles. The organism was identified as **G vaginalis** by matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF). He was treated with 500 mg of ciprofloxacin orally twice daily for 7 total days, based on a search of the available literature at the time, and the patient clinically recovered.

No procedure was done to treat for renal stones. He was readmitted to the hospital with recurrent symptoms 1 month later; urine and blood culture then revealed *Escherichia coli* without isolation of **G vaginalis**.

**CASE 2**

A 61-year-old man with alcohol use disorder, gout, and G6PD deficiency presented to the emergency room with altered mental status. On presentation he was hypothermic, but otherwise he had stable vital signs. His hemoglobin was 8.7 grams/dL and WBC count was $17.8 \times 10^9$ cells/L. His serum creatinine was 1.74 mg/dL. A workup for hemolysis was unremarkable. Serum lactate was 15.7 mM/L, and his anion gap was 32 mEq/L.
| Reference   | Source of Bacteremia                  | Age | Comorbidities                  | Case Presentation/Clinical Course                                      | Urinalysis/Urine Culture                                      | Time to Blood Culture Growth | Treatment, Outcome                                                                 |
|-------------|--------------------------------------|-----|--------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------|
| Bastida Vilá [12] | Urinary tract infection              | 78  | Alcohol use disorder           | Prostatic hypertrophy, recurrent urinary tract infections. Fever, chills, hematuria | Urinalysis with hematuria and 7 WBCs/pf, no growth after 48 hours | 7 days                      | Cefonicid for 10 days, clinical resolution.                                        |
| Babics [13]  | Urinary tract infection              | 36  | None stated                    | Recurrent UTIs. Presented with fever and dysuria. Relapsed. Blood and urine cultures positive at readmission. | Urinalysis negative, Gram-negative cocco/bacilli seen, no growth. G vaginalis on readmission | 5 days                      | Ciprofloxacin 14 days. Relapsed. Azithromycin + ceftriaxone, for 14 days, clinical resolution. |
| Bhatia [14]  | Traumatic urinary catheter insertion | 51  | AIDS (off ART)                 | Presented with cryptococcal meningitis, developed urinary retention. Three attempts to place a urinary catheter followed by fever. | Urinalysis negative, urine culture not done                     | 7 days                      | Ceftriaxone initially then metronidazole orally for 2 weeks, clinical resolution. |
| Wilson [15]  | Urethral stricture                   | 19  | None stated                    | Urethral stricture. Fevers and chills; admitted to ICU for septic shock. | Urinalysis with pyuria, Gram-positive bacilli; no growth on culture | 48 hours                    | Cefuroxime and gentamicin. Dilation of urethral stricture. Clinical resolution.    |
| Harper [16]  | s/p TURP                             | 60  | None stated                    | s/p TURP, developed rigors after removal of indwelling urinary catheter on postoperative day 3. | Urinalysis with scant RBCs and WBCs, G vaginalis on culture | 24 hours                    | Gentamicin. Clinical outcome not stated.                                          |
| Patrick [17] | s/p TURP                             | 57  | None stated                    | s/p TURP developed fever.                                               | Urinalysis with 20 WBCs/pf, no growth                          | 7 days                      | Co-trimoxazole 2 tabs twice daily (no duration listed). Clinical resolution.       |
| Alfraji [18] | Nephrolithiasis                     | 77  | CAD s/p CABG, colon cancer s/p hemicolecotomy | Altered mental status and urinary frequency; found to have a renal calculus. No surgical intervention. | Urinalysis with numerous WBCs, no growth                      | Not stated                   | Ceftriaxone, then metronidazole to complete a 10-day course. Clinical resolution. |
| Lagacé-Wiens [11] | Pyelonephritis with nephrolithiasis | 41  | None stated                    | Admitted for flank pain, pyelonephritis, and discharged without antibiotics. Returned 2 days later with worsened symptoms. Ureretal stent placed. | >107 E. coli per mL (at readmission) | 5 days                      | Ciprofloxacin. Clinical resolution.                                                |
| Pritchard [19] | Pyelonephritis with nephrolithiasis  | 36  | Diabetes, HTN                  | Initial admission for flank pain, pyelonephritis, and discharged without antibiotics; Returned with abdominal pain, fever, and worsening flank pain. Nephrostomy tube placed. | Urinalysis with 51 WBCs/pf, >105 G vaginalis per mL (at readmission) | 72 hours                    | Vancomycin, gentamicin, completed metronidazole for 14 days. Clinical resolution. |
| Denoyel [20] | Prostatic adenoma                    | 65  | None stated                    | Prostatic adenoma. Urinary frequency, urgency, fevers for 15 days. Urinary retention due to prostatic adenoma. | Urinalysis negative, no growth                               | NA                          | Amoxicillin and gentamicin. Unclear duration.                                      |
| Yoon [6]     | Endocarditis                         | 39  | Diabetes                       | Weight loss, malaise for 4 months. Vegetations on mitral valve with septic emboli to the kidney and brain. Underwent valvuloplasty, cultures and histology of the valve were unrevealing | No growth                                                       | At least 72 hours            | Ceftriaxone and gentamicin, then metronidazole, ceftriaxone, erythromycin PO. Unclear clinical outcome. |
| Reference       | Source of Bacteremia                  | Age  | Comorbidities       | Case Presentation/Clinical Course                                                                 | Urinalysis/Urine Culture        | Time to Blood Culture Growth | Treatment, Outcome                      |
|----------------|---------------------------------------|------|---------------------|--------------------------------------------------------------------------------------------------|----------------------------------|------------------------------|--------------------------------------|
| Legrand [21]   | Pneumonia, empyema, lung abscess      | 41   | Alcohol use disorder| Fever and altered mental status. Found to have pneumonia, lung abscess, and empyema. Multiple bronchoscopic washings showed “contaminating oral flora” but eventually *G. vaginalis* was isolated. Empyema culture with *Streptococcus milleri*, *Bacteroides oralis*, *Neisseria sicca*, and *G. vaginalis* | Not reported                     | 48 hours                     | Ceftazidime, penicillin, minocycline and metronidazole, dinodamycin and ampicillin + minocycline, chloramphenicol (injected to pleural space). Expired after major fistulization between the abscess and the pleural space. |
| Current Report | Unknown                               | 61   | HTN, alcohol use disorder, gout, G6PD deficiency | Presented with altered mental status, found to have odontogenic sinusitis and a possible periodontal abscess, which was drained. | No urinalysis reported. No growth on urine culture | 96 hours                     | Amoxicillin-clavulanic acid (14 days). Clinical resolution. |
| Current Report | Nephrolithiasis                       | 56   | DM                  | Present with altered mental status, found to have signum vasculitis and a possible periodontal abscess, which was drained. | Urinalysis with pyuria, mixed Gram-positive flora < 10^6 CFU/mL, reported as suggestive of contamination | 48 hours                     | Ciprofloxacin (7 days). Recurrent symptoms 1 month later, however, with different organisms |

Abbreviations: AIDS, acquired immunodeficiency syndrome; ART, antiretroviral therapy; CABG, coronary artery bypass graft; CAD, coronary artery disease; CFU, colony-forming unit; DM, diabetes; HLD, hyperlipidemia; hpf, high-powered field; HTN, hypertension; ICU, intensive care unit; IV, intravenous; lpf, lower-powered field; NA, not applicable; NAFLD, nonalcoholic fatty liver disease; OSA, obstructive sleep apnea; PO, by mouth; RBC, red blood cells; S/p, status post; TURP, transurethral resection of the prostate; UTI, urinary tract infection; WBC, white blood cells.

### DISCUSSION

In 1955, Gardner and Dukes [2, 3] first described *G. vaginalis*, bacteremia in men is a rare phenomenon, but almost all infections have originated in the genitourinary tract [1]. *G. vaginalis* bacteremia in men is a rare phenomenon, but almost all infections have originated in the genitourinary tract [1]. *Gardnerella vaginalis* bacteremia in men is a rare phenomenon, but almost all infections have originated in the genitourinary tract [1]. *G. vaginalis* has been isolated from men whose female partners were found to carry the organism [7]. Kinghorn et al [8] reported a prevalence of 7.2% in men who presented to their genitourinary department with new urethral complaints. When compared with men who had sex with men, heterosexual men were shown to have a higher prevalence of urethral colonization [9, 10].

A regular inhabitant of the female reproductive tract, *G. vaginalis* has also been isolated from men whose female partners were found to carry the organism [7]. Kinghorn et al [8] reported a prevalence of 7.2% in men who presented to their genitourinary department with new urethral complaints. When compared with men who had sex with men, heterosexual men were shown to have a higher prevalence of urethral colonization [9, 10]. The proposed virulence factors of *G. vaginalis* in bacterial vaginosis include exotoxin secretion (vaginolysin), vaginal mucin degradation by enzymes, and biofilm formation [11]. Other likely mechanisms of virulence include production of hemolysin and sialidase, which result in local tissue damage [11]. It remains uncertain whether these same virulence factors play a role in causing disease in males. *Gardnerella vaginalis* bacteremia in men is a rare phenomenon, but almost all infections have originated in the genitourinary tract [1]. *G. vaginalis* has been isolated from men whose female partners were found to carry the organism [7]. Kinghorn et al [8] reported a prevalence of 7.2% in men who presented to their genitourinary department with new urethral complaints. When compared with men who had sex with men, heterosexual men were shown to have a higher prevalence of urethral colonization [9, 10].

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The patient was treated with vancomycin and cefepime empirically. Admission blood cultures demonstrated *Gardnerella vaginalis* in the anaerobic bottle of 1 of 2 cultures, reported 96 hours after their collection. No urinalysis was reported; however, urine culture remained negative. The patient was treated with ampicillin-sulbactam and switched to amoxicillin-clavulanate on discharge to complete a 14-day course with clinical resolution.
predisposing factor. All 3 cases had identification of the causative organism within 48 to 72 hours of collection of blood cultures, and all received combination antibiotic therapy. The usual methods for routine culture are not likely to isolate this fastidious organism, which leads to a prolonged time to identification. Of those reports that included duration of time between collection of blood cultures and speciation, it ranged from 48 hours to 7 days. Many laboratories relied on automated microbiological identification systems for identification, whereas others had to send the isolates out to reference laboratories for further identification. Our institutional laboratory utilized the MALDI-TOF Biotype® from Bruker Daltonik GmbH, which is capable of phylogenetically differentiating the diverse groups of Gardnerella [22].

Of the 10 cases with a urinary tract as the probable source of bacteremia, 4 showed significant pyuria on urinalysis [15, 17–19], 2 had only scant WBCs [12, 16], 3 had unremarkable urinalyses [13, 14, 20], and 1 with no reported urinalysis [11]. It is interesting to note that only 3 cases demonstrated G vaginalis on urine culture [13, 16, 19].

To date, there are no susceptibility data available for Gardnerella vaginalis from either the Clinical and Laboratory Standards Institute or European Committee on Antimicrobial Susceptibility Testing, and there are no guidelines on the treatment of Gardnerella vaginalis infections in males. Reported minimum inhibitory concentrations from infections in men show that susceptibility to antibiotics is strain-dependent.

CONCLUSIONS

Bacteremic infection in men due to G vaginalis is rare; our 2 cases bring the total reported in the English medical literature to 14. Abnormalities of the urinary tract appeared to be an obvious or likely source in most cases. A source in 3 cases, including our Case 2, is unknown, and only 1 described a urine culture but no urinalysis. Gardnerella vaginalis grows slowly in anaerobic blood culture bottles or under 10% CO2 on chocolate agar plates, so it is not surprising that isolation from urine is only rarely reported. Selection and duration of treatment have ranged widely, likely due to the lack of information on susceptibility to antibiotics or guidance regarding effective treatment.

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