CLINICAL VIGNETTE

A Case of *Pseudoclavibacter alba* Bacteremia

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An 83-year-old man presented to the Emergency Department with fevers, chills, nausea, and dysuria for one day. He denied hematuria, urinary frequency, urinary hesitancy, flank pain, or history of kidney stones. He took one dose of ciprofloxacin prior to presentation to the emergency room. Patient reported prior urinary tract infections with the last episode two years ago. He denied prior multi-drug resistant organism UTI's. The patient's past medical and surgical history were significant for benign prostatic hyperplasia (BPH) status post transurethral resection of the prostate (TURP) eight years ago and a urolift procedure six years ago. Past medical history also included coronary artery disease, hypertension, hyperlipidemia, pre-diabetes, osteoporosis, a renal cyst, glaucoma, and restless leg syndrome.

Vital signs included T of 37°C, BP 105/54mmHg, P 94 bpm, respiratory rate of 18/min, and oxygen saturation of 95% on room air. He was a well-developed, non-toxic appearing, without suprapubic or costovertebral angle tenderness. Admission, labs were notable for a white blood cell count 13.5 $x10^9$/L, hemoglobin 13.6g/dL, creatinine 1.04mg/dL, sodium 133mEq/L, bicarb 19mEq/L, lactate 1.5mmol/L, ESR 2mm/hr, CRP 1.2mg/dL, procalcitonin 0.10ng/mL, and prostate specific antigen (PSA) 6.84ng/mL. His prior PSA in 2019 was 2.7ng/mL. Urine studies were significant for dark yellow, slightly cloudy urine, occasional blood, small leukocyte esterase, negative nitrite, white blood cells of 252/HPF, red blood cells 24/HPF, and no bacteria seen. Remaining labs were all in normal range. CT abdomen and pelvis with intravenous contrast revealed a thick-walled urinary bladder, significant prostatic enlargement (5.7 x 6.6 x 5.4cm), evidence of prior TURP and a stable right renal cyst.

The patient was admitted and started on ceftriaxone 2g IV every 24 hours. Urine culture resulted with no growth. On hospital day 1, one out of four (1:4) blood culture bottles, was positive for gram positive rods, initially thought to be a contaminant. On hospital day 2, two out of four (2:4) bottles were positive for gram positive rods. Gram positive rods were ultimately identified as *Zimmermannella alba*. Identification of the micro-organism was delayed, as the culture had to be processed at an offsite, more advanced lab for special analysis. He was continued on ceftriaxone 2g IV every 24hrs with clinical improvement. Repeat blood cultures were negative. Trans-thoracic echocardiogram was unremarkable. Given enlarged prostate on imaging, elevated PSA, and presence of urolift bands/implants, there was concern for possible acute prostatitis with possible urolift band/implant involvement. After consultation with infectious disease and urology, no emergent surgical intervention was pursued. Patient was discharged on ceftriaxone 2g IV every 24hrs for four to six weeks with close outpatient follow-up with infectious disease and urology. At one-month follow-up his symptoms completely resolved. Repeat PSA decreased to 1.6ng/mL, creatinine was 0.8mg/dL. Per patient's preference, antibiotics were discontinued after 4 weeks and he will follow-up with urology to determine if any further surgical intervention is indicated.

Discussion

Bacteria belonging to the *Pseudoclavibacter* genus are a rare cause of infection in humans and typically affect significantly immunocompromised patients. We present a patient found to have *Pseudoclavibacter alba* bacteremia who is not signify-cantly immunocompromised. The *Zimmermannella* genus was first identified by a German microbiologist O.E.R. Zimmer-mann. The genus includes four species, *Z. alba, Z. helvola, Z. faecalis*, and *Z. bifida*, described by Lin et al. in 2004.[1] However, Manaia et al. had identified the new genus in an earlier publication naming it *Pseudoclavibacter*. Given Manaia et al. was the initial publication, *Pseudoclavibacter* is con-sidered the legitimate name of the genus, not *Zimmermannella*.[2] However, one may still see *P. alba* referred to as *Z. alba, P. bifida* referred to as *Z. bifida*, and so forth. *Pseudoclavibacter* genus already consists of four species, including *P. caeni*, *P. chungangensis*, *P. helvolus*, and *P. soli*.[3] *Pseudoclavibacter* are commonly found in the soil.[3] However, they have also been isolated from human urine, blood and wounds (*P. alba, P. bifida, P. helvola*),[1,3] cow feces and butter (*P. helvola*).[1]

Pseudoclavibacter genus, constitutes a novel genus within the Microbacteriaceae family. The Microbacteriaceae family is a member of the order Actinomycetales and the class Actinobacter.[2] *Pseudoclavibacter* are characterized as gram positive, aerobic, non-spore forming, catalase positive, rod-shaped bacteria. They typically appear as white circular, convex, smooth colonies on PY-BHI agar[1] and are difficult to isolate by phenotypic characteristics alone.[3] Identification of the organism typically requires special analysis, including 16S rRNA gene sequencing.[3] Per review of the literature, there have only been a few published cases of *Pseudoclavibacter* soley causing infection in humans. The affected individuals are mostly immunocompromised. In 2004, Lemaitre et al. pub-lished the first reported case of cutaneous and subcutaneous

infection in a human due to a *Pseudoclavibacter*-like organism. An 81-year-old male presented with a chronic wound infection not improving on clindamycin and metronidazole. Subcutaneous swab revealed polymorphonuclear cells, and multiple bacteria including gram positive rods. The gram-positive rod was found to have a 99% sequence similarity with *Pseudoclavibacter* species.[4]

In 2013, Oyaert et al. published the first reported case of *P. bifida* bacteremia in an elderly immunocompromised COPD patient. An 86-year-old male presented with fever, dyspnea, and acute respiratory distress. Blood cultures revealed *P. bifida*. The patient died from bilateral pneumonia after 8 days of hospitalization, despite appropriate antibiotic treatment.[3]

In 2014, the first case of endocarditis caused by *Pseudoclavibacter* was published in the *Journal of Clinical Microbiology* by Pailhoriès et al. A 44-year-old male with a history of mitral valve insufficiency status-post mitral valve repair with annuloplasty ring and ischemic cerebrovascular accident attributed to atrial fibrillation presented with heart flutters, left facial palsy, and fever. Evaluation was consistent with transient ischemic attack due to endocarditis. Patient underwent mechanical bi-leaflet mitral valve replacement. Valve specimen gram staining revealed gram positive rods. Further testing revealed 99.7% similarity to *Pseudoclavicular* species.[2]

In 2015, Issaranggoon Na Ayuthaya et al. described the first reported case of Pseudoclavibacter otitis media in an immunocompromised pediatric patient. A 3-year-old boy with pulmonary and spinal tuberculosis presented with fever and progressive paraplegia for 3 months. Bilateral ear discharge cultures revealed gram positive rods with a branching pattern. 16S rRNA sequencing demonstrated a 99.4% similarity to Pseudoclavibacter species. The patient clinically improved on a six-week course of intravenous trimethoprim/sulfamethoxazole.[5]

As seen above, infected patients are often immunocompromised. Literature review did not identify any published cases of P. alba causing illness in humans. However, it has been isolated in human urine, blood, and wounds. Our patient presented with a urine tract infection, possible acute prostatitis, and bacteremia. Urine culture revealed no growth; however, our patient had taken ciprofloxacin prior to arrival to the emergency room. Trans-thoracic echocardiogram was unremarkable. After special analysis, including 16S rRNA sequencing, peripheral blood cultures were found to be positive for P. alba. Our patient was not particularly immunosuppressed and recovered after four weeks of intravenous ceftriaxone. Repeat blood cultures were negative, thus there was low suspicion for infection of urolift band/implants. Patient will continue to be followed closely by urology and infectious disease. This case identifies Pseudoclavibacter as a potential pathogen in immunocompetent patients and confirms the need for more advanced analysis in order to accurately identify the organism.

REFERENCES

1. **Lin YC, Uemori K, de Briel DA, Arunpairojana V, Yokota A**. Zimmermannella helvola gen. nov., sp. nov., Zimmermannella alba sp. nov., Zimmermannella bifida sp. nov., Zimmermannella faecalis sp. nov. and Leucobacter albus sp. nov., novel members of the family Microbacteriaceae. *Int J Syst Evol Microbiol*. 2004 Sep;54(Pt 5):1669-1676. doi: 10.1099/ijs.0.02741-0. PMID: 15388726.
2. **Pailhoriès H, Lemarié C, Quinqueneau C, Eveillard M, Baufreton C, Rouleau F, Mahaza C, Joly-Guillou ML, Kempf M**. First report of endocarditis caused by a Pseudoclavibacter species. *J Clin Microbiol*. 2014 Sep;52(9):3465-7. doi: 10.1128/JCM.01388-14. Epub 2014 Jul 2. PMID: 24989608; PMCID: PMC4313186.
3. **Oyaert M, De Baere T, Breyne J, De Laere E, Mariën S, Waets P, Laffut W**. First case of Pseudoclavibacter bifida bacteremia in an immunocompromised host with chronic obstructive pulmonary disease (COPD). *J Clin Microbiol*. 2013 Jun;51(6):1973-6. doi: 10.1128/JCM.00138-13. Epub 2013 Mar 27. PMID: 23536403; PMCID: PMC3716097.
4. **Lemaitre F, Stein A, Raoult D, Drancourt M**. Pseudoclavibacter-like subcutaneous infection: a case report. *J Med Case Rep*. 2011 Sep 20;5:468. doi: 10.1186/1752-1947-5-468. PMID: 21933406; PMCID: PMC3189147.
5. **Ayuthaya SIN, Leelaporn A, Kiratisin P, Oberdorfer P**. Pseudoclavibacter otitis media in a 3-year-old boy with pulmonary and spinal tuberculosis. *Medicine (Baltimore).* 2015 May;94(17):e709. doi: 10.1097/MD.0000000000000709. PMID: 25929901; PMCID: PMC4603054.