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Case Report **OPEN ACCESS**

Pseudomonas Luteola Infection: First Case Report of Urinary Tract Infection and Review of Literature

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ABSTRACT

Pseudomonas luteola (P. luteola) is rarely reported as a human bacterial pathogen. However, it may cause several serious infections, mainly in immuncompromised patients. We report here the first case of urinary tract infection due to *P. luteola* and we review, by searching in Pub Med all cases of *P. luteola* infection.

Keywords: *Pseudomonas luteola*, urinary tract infection, antibiotherapy

INTRODUCTION

P. luteola is a gram-negative non fermentative and motile bacillus [1]. It is a rare saprophyte commensal in humans, but it may cause severe infections, especially in patients with health disorders [1]. We report the first case of urinary tract infection due to *P. luteola* in a 69-year-old patient with chronic renal failure.

CASE REPORT

A 69-year-old male, with prior history of diabetes mellitus treated with insulin therapy, benign prostatic hyperplasia, and end stage renal failure requiring hemodialysis 3 times a week, presented to the hospital with dysuria, burning miction and intermittent left lumbar fossa pain for 6 days. Physical examination revealed a blood pressure of 128/80 mmHg, pulse of 95 beats/min and body temperature of 38.7 °C. The arteriovenous fistula was clean. The heart sounds were normal and there was no murmur. Abdominal examination revealed tenderness in left flank. The prostate is painless in the rectal exam. Results of Laboratory investigations included hemoglobin (9.1 g/dl), white cells count (6150/mm^3), C-reactive protein (32 mg/L), blood urea (14.2 mmol/l) and creatininemia (795 µmol/l). Abdomino-pelvic ultrasonography was normal. Urine microscopy showed countless leukocytes. The patient was treated by empirical intravenous antibiotherapy: ceftriaxone and ciprofloxacin for 2 days but no clinical improvement was noted. Blood cultures were negative. On 3th day, *P. luteola* was identified in urine. It was sensitive to piperacillin- tazobactam, ceftazidime, cefepime, aztreonam, imipenem, fosfomycin and colistin and resistant to ampicillin, augmentin, cefotaxim, ceftriaxone, norfloxacin, ciprofloxacin, gentamicin, amikacin, tobramycin, tigecycline and cotrimoxazole.

According to the results of the antibiotic susceptibility testing, ceftazidime (1g/day after dialysis) was administered parenterally. After 48 hours, the fever disappeared, urinary disorders subsided and CRP decreased. Ceftazidime was prescribed for a total duration of 11 days with good outcome. After one month, the patient was admitted again with a severe sepsis (hypotension 68/48, pulse 110 bpm). He has reported left flank pain with burning miction and vomiting since 6 days, without fever. Physical examination revealed apyrexia, tenderness in left lumbar fossa, and an arterial oxygen saturation equal to 94% without respiratory signs. Pulmonary auscultation was normal and the arterioveinous fistula was functional and clean. Laboratory findings included a hemoglobin of 9 g/dl, a white blood cell count of 11000/mm^3 and a C-reactive protein level of 112 mg/L. The serum level of urea was 28,9 mg/dl and of creatinine was 799 µmol/l. Serum protein, bilirubin, electrolytes and liver enzyme profile were all normal. Electrocardiogram and chest X-ray were normal. His breathing and heart were monitored. At this time, the patient had urine output, so a urine sample was taken showing countless leukocytes. Considering the *P. luteola*'s anterior urinary tract infection, an association of gentamicin (3 mg/kg/day) and imipenem (500 mg/day) was started. In the following 4 hours, the patient's state worsed and he presented a cardiopulmonary arrest. The patient was dead despite resuscitative efforts. We were not able to do a post-mortem examination but we thought that our patient had presented multivisceral failure due to severe sepsis caused by urinary tract infection. Unfortunately, the urine culture returned contaminated after two days.

DISCUSSION

P. luteola, a gram-negative aerobic bacillus, was first described by Tatum et al. and was previously known by Centers for Disease Control and Prevention (CDC) as group Ve-1 and Chryseomonas luteola [1]. Due to the close phylogenetic relatedness between Chryseomonas and Pseudomonas, this bacterium was reassigned to the genus Pseudomonas as *P. luteola* [2]. Its habitat is not determined, but it is usually found in water, soil, and moist environments [3,4]. All the previously reported cases suggest that *P. luteola*, although a rare saprophyte, could emerge as a potential pathogen [5]. The predisposing factors for infection with *P. luteola* include immunosuppressive conditions like use of corticosteroids and other immunosuppressive therapy, malignancy tumors and chronic renal failure such as our case [2]. In other cases, the infection is associated with indwelling catheters and prostheses [6,7]. Nosocomial infections are more frequent than community acquired ones, especially in immunocompromised patients [1]. In our case, the patient had a community acquired urinary tract infection by this bacterium. *P. luteola* has a variable sensitivity to penicillins, cephalosporins, tetracyclines, and cotrimoxazole and is often sensitive to imipenem, aminoglycosides and fluoroquinolones such as ciprofloxacin [4,8,9]. In our case, *P. luteola* was sensitive to piperacillin/ tazobactam, ceftazidime, cefepime, aztreonam and imipenem, but resistant to ampicillin, augmentin, cefotaxim, ceftriaxone, tigecycline, cotrimoxazole, amikacin, gentamicin, tobramycin and ciprofloxacin. According to our research on Pub Med from 1980 until November 2020, we found only 19 cases of *P. luteola*'s infection in adults. A summary of main features of these cases is put in **Table 1** [1, 4-21]. This

Table 1. Summary of all reported cases with Pseudomonas luteola's infection

References	Infection	Cases number	Risk Factors	Susceptibility status	Treatment	Outcomes
Connor et al. *(1987)* [10]	Peritonitis	2	End-stage renal disease	S: tobramycin and trimethoprim-sulfamethoxazole R: cefazolin	Remove dialysis catheter + Antibiotherapy	Alive
Su et al. (2014) [11]			Peritoneal dialysis	S: gentamicin, amikacin, ceftazidime, ciprofloxacin, imipenem, cefepime, piperacillin, and piperacillin-tazobactam	Ceftazidime + Gentamicin (15 days)	Alive
Rastogi and Sperber (1998) [12]	Cutaneous Infection	6	Immunocompetent	S: ampicillin, gentamicin, trimethoprim-sulfamethoxazole, ceftriaxone, and ciprofloxacin R: cefazolin and cefuroxime	Intraveinous ceftriaxone 2 g / day	Alive
Tsakris et al. (2002) [13]			Sickle cell disease	S: aminoglycosides (amikacin, gentamicin, tobramycin), ciprofloxacin, ceftazidime, cefepime and imipenem R: cephalosporins (cephalothin, cefuroxime, cefoxitin, ceftriaxone), ampicillin, amoxycillin/clavulanate, aztreonam and trimethoprim/sulfamethoxazole	Local treatment with sterilized water + local instillation of the growth factor G-CSF	Alive
Dalamaga et al. (2004) [7]			Steroid Therapy	S: cefuroxime, ceftazidime, cefriaxone, cefepime, aztreonam, imipenem, meropenem, quinolones (ciprofloxacin, pefloxacin), trimethoprime/sulfamethoxazole, aminoglycosides (amikacin, gentamicin, tobramycin), ticarcillin and piperacillin R: ampicillin and amoxycillin/clavulanate	Drainage of the abscess + intraveinous ceftazidime 1 g*3/day + intraveinous amikacin 500 mg*2/day (15 Days)	Alive
Jayagopal et al. (2004) [14]			Immunocompetent	S: oxytétracycline, ciprofloxacine	Oxytetracycline followed by ciprofloxacin (14 days)	Alive
Ramana et al. (2010) [5]			Coronary artery bypass graft + high blood pressure	S: ampicillin, amoxicillinclavulinic acid, pipercillin-tazobactum, gentamicin, ceftriaxone, cefotaxime, ciprofloxacin, ofloxacin, imipenem, tetracycline, trimethoprim-sulphamethoxazole, colistin and tigicycline	Incision drainage and surgical debridement + amoxicillin-clavulinic acid and ciprofloxacin	Alive
Roberts et al. (2018) [8]			Immunocompetent	S: ceftazidime, amikacin, gentamicin and tobramycin, ciprofloxacin R: ampicillin, augmentin, imipenem, bactrim Intermediate sensitivity: cefotaxime, ceftriaxone	Amputation + Antibiotherapy	Alive
Casalta et al. (2005) [15]	Endocarditis	1	Aortic remplacement for aortic insuffisancy	S: ampicillin, ureidopenicillin, third-generation cephalosporins, fluoroquinolones, aminoglycosides	Ticarcillin + clavulanic acid 3 g*5/ day (60 days) + gentamicin 210 mg once a day (15 days)	Alive
Goteri et al. (2010) [16]	Mediastinal abscess	1	Autoimmune thrombocytopenia + Steroid Therapy	No data	Meropenem 70 mg/kg three times/day + ciprofloxacin 500 mg*2/day (6 weeks)	Alive
Anuradha et al. (2010) [17]	Biliary tract infection	1	Immunocompetent	S: amikacin, ciprofloxacin,imipenem, Polymyxin B R: ampicillin, amoxycillin-clavulanic acid, piperacillin, piperacillin-tazobactam. cefotaxime, ceftriaxone, ceftazidime	Hepaticojejunostomy + intravenous antibiotherapy (cefotaxime + gentamycin + metronidazole)	Alive
Ngoh et al. (2011) [9]	Pneumonia	3	Diabetes, asthma, high blood pressure, inter-ventricular stent	S: piperacillin, piperacillin-tazobactam, ticarcillin, ceftazidim, gentamycin, rifampicin R: imipenem, aztreonam, tobramycin, amikacin, ciprofloxacin, tetracyclin, and trimethoprim-sulfamethoxazole	Imipenem + amikacin + teicoplanin + fuconazole	Dead
Jacob et al. (2015) [18]			Immunocompetent	No data	Intraveinous ciprofloxacin (14 days)	Alive
Dharmayanti et al. (2017) [19]			Guillain Barre Syndrome	No data	Intraveinous meropenem	Alive

S=sensitive**; R=**resistant

Table 1 (continued). Summary of all reported cases with Pseudomonas luteola's infection

References	Infection	Cases number	Risk Factors	Susceptibility status	Treatment	Outcomes
Yousefi et al. (2014) [1]	Pleuritic empyema	1	Pulmonary tuberculosis	S: trimethoprim-sulfamethoxazole, Intermediate: gentamycin R: ampicillin, cefepime, ciprofloxacin, norfloxacin, nalidixicacid.	Cotrimoxazole	Alive
Otto et al. (2013) [6]	Septicemia	2	Lung carcinoma	S: third-generation cephalosporins, aminoglycosides, ureidopenicillins, ciprofloxacin R: first and second-generation cephalosporins	Intraveinous piperacillin 16 g/day (14 days)	Alive
Balew et al. (2017) [4]			Hodgkin lymphoma	No data	No data	No data
Harvey et al. (2007) [20]	Endophtalmitis	2	Immunocompetent	S: piperacillin/tazobactam, trimethoprim/sulfamethoxazole, cefepime R: amikacin	Topical medication + intravitreal injection of piperacillin/tazobactam + oral cotrimoxazole	Alive
Naik et al. (2018) [21]			Immunocompetent	S: Ciprofloxacin	Ocular surgery + Ciprofloxacin	Alive
Our case, 2020	Urinary tract infection	1	End-stage renal disease	S: piperacillin-tazobactam, ceftazidime, cefepime, aztreonam, imipenem, fosfomycin, colistin R: ampicillin, augmentin, cefotaxim, ceftriaxone, ciprofloxacin, gentamicin, amikacin, tobramycin, tigecycline and cotrimoxazole.	First episode : ceftazidime (1 g after dialysis), 11 days	Recovery
					Second episode : gentamicin (3 mg/kg/day) + imipenem (500 mg/day)	Dead

S=sensitive**; R=**resistant

microorganism was reported to produce septicemia [4-7,9,12], endocarditis [15], pleuritic empyema [1], mediastinal abscess [16], pneumonia [9,18,19], peritonitis [10, 11], biliary tract infection [17], endophtalmitis [20,21] and cutaneous infection [5,7,8,12,14]. To the best of our knowledge, our case is the first reported case of urinary tract infection caused by *P. luteola*. The majority of cases in the literature review (15/20) had progressed favourably under adequate antibiotic treatment. Ngoh et al. [9] reported a fatal case of *P. luteola*'s pneumonia in a patient with multiple comorbidities. The patient was admitted to the Intensive Care Unit and he had received an aggressive therapy (imipenem, amikacin, teicoplanin, and fluconazole) but he was died three days later after multivisceral failure. The strain was resistant to imipenem, and amikacin. Our patient had two episodes of UTI one month apart. In the first one, *P. luteola* was identified and the patient was treated by intravenous ceftazidime with a clinical improvement. In the second one, the patient received an association of gentamicin and imipenem but his clinical state worsed and he was dead after 4 hours of intensive care. We had no idea about the microorganism implicated in this recurent UTI but *P. luteola* can be the incriminated agent, in particular a strain resistant to imipenem and aminoglycosides. Due to its variable resistance pattern, *P. luteola* should be considered as a possible culprit when infections are unresolving, particularly in immunocompromised patients [8].

CONCLUSION

In this work we have reported on the main aspects of P. luteola infections in adults. Due to the gravity associated with infection by *P. luteola* in such cases, we believe it is useful to report on our experience for the purpose of increasing knowledge in P. luteola and its pathological complications and improving the treatment of this infection especially for those already infected.

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