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

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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 examination. Results of Laboratory investigations included hemoglobin (9.1 g/dl), white cells count (6150/mm³), 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 antibiotic therapy: 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 pipericillin- tazobactam, ceftazidine, 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 arteriovenous fistula was functional and clean. Laboratory findings included a hemoglobin of 9 g/dl, a white blood cell count of 11000/mm³ 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, ceftaxinone, 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) [16] | Peritonitis | 2 | End-stage renal disease | S: tobramycin and trimethoprim-sulfamethoxazole R: cefazolin | Remove dialysis catheter + Antibiotherapy | Alive |
| Su et al. (2014) [14] | Peritoneal dialysis | 1 | | S: gentamicin, amikacin, ceftazidime, ciprofloxacin, imipenem, cefepime, piperacillin, and piperacillin-tazobactam | Ceftazidime + Gentamicin (15 days) | Alive |
| Rastogi and Sperber (1998) [12] | Immune competent | | | S: ampicillin, gentamicin, trimethoprim-sulfamethoxazole, ceftriaxone, and ciprofloxacin | Intravenous ceftriaxone 2 g/ day | Alive |
| Tsakis et al. (2002) [13] | Sickle cell disease | 4 | | S: aminoglycosides (amikacin, gentamicin, tobramycin), ciprofloxacin, ceftazidime, cefepime and imipenem R: cephalosporins (cefdinacin, cefuroxime, cefotaxim, 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] | Cutaneous infection | 6 | Steroid Therapy | S: cefuroxime, ceftazidime, ceftriaxone, cefepime, aztreonam, imipenem, meropenem, quinolones (ciprofloxacin, pefoxacin), trimethoprim/sulfamethoxazole, aminoglycosides (amikacin, gentamicin, tobramycin), ticarcillin and piperacillin R: ampicillin and amoxycillin/clavulanate | Drainage of the abscess + intravenous cefazidime 1 g/3/day + intravenous amikacin 500 mg/2/day (15 Days) | Alive |
| Jayagopal et al. (2004) [14] | Immunocompetent | | | S: oxytetracycline, ciprofloxacin | Oxytetracycline followed by ciprofloxacin (14 days) | Alive |
| Ramana et al. (2010) [15] | Coronary artery bypass graft + high blood pressure | | | S: ampicillin, amoxicillin/clavulanic acid, piperacillin-tazobactam, gentamicin, ceftriaxone, cefotaxime, ciprofloxacin, ofloxacin, imipenem, tetracycline, trimethoprim-sulfamethoxazole, colistin and tigecycline | Incision drainage and surgical debridement + amoxicillin-clavulanic acid and ciprofloxacin | Alive |
| Roberts et al. (2018) [16] | 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 replacement for aortic insufficiency | S: ampicillin, ureidopenicillin, third-generation cephalosporins, fluoroquinolones, aminoglycosides | Ticarcillin + ceflavinic acid 3 g/5/ day (60 days) + gentamicin 210 mg once a day (15 days) | Alive |
| Goteeri et al. (2010) [17] | Mediastinal abscess | 1 | Autoimmune thrombocytopoemia + 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, amoxicillin-clavulanic acid, piperacillin, piperacillin-tazobactam. cefotaxime, ceftriaxone, ceftazidime | Hepaticojunostomy + intravenous antibiotherapy (cefotaxime + gentamicin + meropenidazole) | Alive |
| Ngob et al. (2011) [19] | Pneumonia | 3 | Diabetes, asthma, high blood pressure, inter-ventricular stent | S: piperacillin, piperacillin-tazobactam, ticarcillin, ceftazidim, gentamicin, rifampicin R: imipenem, aztreonam, tobramycin, amikacin, ciprofloxacin, tetracyclin, and trimethoprim-sulfamethoxazole | Imipenem + amikacin + teicoplanin + fusconazole | Dead |
| Jacob et al. (2015) [18] | Immunocompetent | | | No data | Intravenous ciprofloxacin (14 days) | Alive |
| Dharmayanti et al. (2017) [19] | Guillain Barre Syndrome | | | No data | Intravenous meropenem | Alive |
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], endophthalmitis [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.

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

| References                  | Infection                  | Cases number | Risk Factors                        | Susceptibility status | Treatment                          | Outcomes |
|-----------------------------|----------------------------|--------------|-------------------------------------|-----------------------|------------------------------------|----------|
| Otto et al. (2013) [6]      | Lung carcinoma             | 2            | S: third-generation cephalosporins, aminoglycosides, ureidopenicillins, ciprofloxacin R: first and second-generation cephalosporins | Intraocular piperacillin 16 g/day (14 days) | No data | No data |
| Balew et al. (2017) [4]     | Hodgkin lymphoma           |              |                                      |                       | Topical medication + intravitreal injection of piperacillin/tazobactam + oral cotrimoxazole | Alive    |
| Harvey et al. (2007) [20]   | Endophthalmitis            | 2            | S: piperacillin/tazobactam, trimethoprim/sulfamethoxazole, cefepime R: amikacin |                       | Ocular surgery + Ciprofloxacin     | Alive    |
| Naik et al. (2018) [21]     | Urinary tract infection    | 1            | S: piperacillin/tazobactam, cefazidime, cefepime, aztreonam, imipenem, fosfomycin, colistin R: ampicillin, augmentin, cefotaxim, ceftriaxone, ciprofloxacin, gentamicin, amikacin, tobramycin, tigecycline and cotrimoxazole. | First episode: cefazidime (1 g after dialysis), 11 days | Second episode: gentamicin (3 mg/kg/day) + imipenem (500 mg/day) | Recovery |

|##sensitive| R= resistant |

**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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