Infective Endocarditis Caused by *Pseudomonas luteola* in a Pediatric Patient: A Case Report and Literature Review

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Patient: Female, 9-year-old
Final Diagnosis: Central line infection • infective endocarditis • *Pseudomonas luteola*
Symptoms: Fever
Medication: —
Clinical Procedure: —
Specialty: Infectious Diseases • Microbiology and Virology

Objective: Rare disease
Background: *Pseudomonas luteola* (*P. luteola*) is a Gram-negative, oxidase-negative bacillus. It is an environmental organism that is isolated from soil, water, and damp areas, and is rarely found as a human pathogen. Recently, it is increasingly considered as an important cause of hospital-acquired infections. Most infections in which *P. luteola* is implicated are associated with a breach in the immune barrier, such as indwelling catheters, prosthetic devices, immunocompromised conditions, and surgical wounds. Here, we present a rare case of infective endocarditis caused by *P. luteola* in a young female patient after being on a long-term peripherally inserted central venous catheter (PICC).

Case Report: A 9-year-old girl known to have Crohn’s disease and recurrent urinary tract infections, on prophylactic antibiotics, presented with an acute-onset abdominal pain associated with fever reaching 40°C and vomiting. She was placed on a peripherally inserted central line for total parenteral nutrition and developed sepsis on the 30th day of admission. Septic workup revealed *P. luteola* from both blood cultures and catheter tip cultures, with right atrial vegetation on echocardiogram. The diagnosis of infective endocarditis was confirmed and she was treatment with piperacillin/tazobactam for 6 weeks and had an uneventful recovery.

Conclusions: *P. luteola* can be involved in serious infections in susceptible individuals. Serious outcomes may be associated with infective endocarditis, especially on a background of valvular prosthesis and central lines. The definitive treatment of catheter-related infective endocarditis caused by *P. luteola* is the removal of the lines, along with an appropriate antibiotic regimen-based antimicrobial susceptibility testing (AST) result.

Keywords: Endocarditis, Bacterial • Piperacillin, Tazobactam Drug Combination • *Pseudomonas luteola*

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/935743
**Background**

*Pseudomonas luteola* (*P. luteola*) is a Gram-negative, oxidase-negative aerobic, non-spor-forming organism that is found ubiquitously in soil, water, and damp areas [1,2]. It grows within 48 h, yielding small, wrinkled, or rough yellowish colonies on MacConkey or blood agar [1,2]. Recently, it is increasingly considered as an important cause of hospital-acquired infections [1,3-18]. Reported cases describe an association with central venous lines, peritoneal hemodialysis, intubation, prosthetic devices, post-surgical complications, trauma, or immunocompromised conditions [1,3-18]. Most reported cases were bacteremia, endocarditis, peritonitis, endophthalmitis, osteomyelitis, or cutaneous infection presenting with fever, purulent peritoneal fluid, or bone pain, depending on the site of infection [2,3,6,7,9,11,13-15]. Here, we present a rare case of infective endocarditis caused by *P. luteola* in a young female patient after being on a long-term peripherally inserted central venous catheter (PICC).

**Case Report**

**Past History**

A nine-year-old girl known to have Crohn’s disease with enteric-neric and enter-eros-velical fistulae presented to the Emergency Department reporting acute onset of lower abdominal pain accompanied with fever and non-bilious vomiting. The pain was mainly in the left iliac fossa, scoring 9/10 in severity. She had a documented history of chronic on-off abdominal pain. There was no change in bowel habits or change in urine frequency or any genitourinary tract symptoms. No upper respiratory tract symptoms were documented. She was diagnosed with Crohn’s disease 1 year prior to her current presentation; her first presentation was in 2018 in the form of acute appendicitis, for which she underwent a laparoscopic appendectomy complicated by a polymicrobial pelvic abscess (*Escherichia coli* and *Klebsiella aerogenes*) treated by laparoscopic drainage and a course of ciprofloxacin, ceftriaxone, and metronidazole. Furthermore, she had a history of recurrent Gram-negative bacilli urinary tract infection (UTI) secondary to entero-vesical fistula treated with different courses of antibiotics. On examination, she was febrile with a temperature of 40.3°C, with a heart rate of 100 beats/minute, a respiratory rate of 24 breaths/minute, a blood pressure of 110/69 mmHg, and an oxygen saturation of 99% on room air. Abdominal examination revealed a soft abdomen with suprapubic and paramaembilical tenderness and was otherwise unremarkable. Initial urine analysis showed +3 leukocyte esterase, WBC >100 cells per high-power field, and negative nitrate. Complicated pyelonephritis was suspected and the patient was admitted to the ward as a case of UTI and Crohn’s flare-up and was started on meropenem (950 mg i.v. every 8 h) and vancomycin (360 mg i.v. every 6 h).

**Present Illness**

On the 30th day of admission, her temperature rose to 40°C with marked pallor, tachycardia, and tachypnea, associated with malaise and fatigue. A septic workup was done (results are shown in Table 1). Furthermore, 3 sets of blood cultures collected from the PICC line and a catheter tip culture were sent for laboratory analysis on 3 consecutive days.

**Microbiology Laboratory Findings**

All of the 3 sets of blood cultures vials were incubated in the Bact/Alert Virtuo system (BioMérieux, France) for a total of 5 days, and the PICC line tip culture was inoculated by rolling the tip technique across a sheep blood agar and incubating at 37°C, according to the internal policies and procedures of the microbiology laboratory at King Fahd Hospital of the University. After 24 h of incubation of the blood culture sets, all blood culture vials flagged positive, and direct gram stain showed Gram-negative bacilli. Subsequently, blood vials were sub-cultured to sheep blood agar, MacConkey agar, chocolate agar, and anaerobic blood agar. Overnight incubation showed heavy growth of wrinkled small yellow colonies in the sheep blood agar and non-lactose-fermenting colonies in MacConkey agar. The gram stain from cultured colonies showed small Gram-negative rods. Results of the oxidase test were negative. The isolate was identified as *P. luteola* using MALDI-TOF-MS (VITEK MS; bioMérieux) and Knowledge Base database (version 3.0), with a confidence value of 99.9%. Antimicrobial susceptibility testing (AST) was performed using the VITEK 2 system (BioMérieux, France). The isolate was sensitive to ceftizime, piperacillin/tazobactam, gentamicin, and ciprofloxacin. Furthermore, PICC line tip culture grew >15 CFU/plate yellow wrinkled colonies identified as *P. luteola* using MALDI-TOF-MS (VITEK MS; bioMérieux). An impression of central line-associated blood stream infection (CLABSI) was made, and the clinical team was advised to perform echocardiography (echo) to rule out the possibility of infective endocarditis. On the following day, echo revealed a vegetation of 0.8-1.0 mm in the right atrium at the connection site of the superior vena cava, which confirmed the diagnosis of infective endocarditis.

**Table 1. Septic work-up panel results.**

| Test                  | Result | Reference range |
|-----------------------|--------|-----------------|
| WBC                   | 5.8    | 4.5-13.5        |
| Procalcitonin        | 0.2    | <0.1            |
| C reactive protein   | 4.5 mg/dl | 0.05-0.3 mg/dl |

The patient was doing well until her 14th day of admission, when a PICC line was inserted to initiate total parenteral nutrition (TPN) due to Crohn’s disease flare.

**Conclusion**

This case report highlights the importance of considering uncommon causes of infective endocarditis and emphasizes the need for prompt recognition and appropriate management of these cases to prevent serious complications.

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**Microbiology Laboratory Findings**

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| Author (yr) [ref] | Age/sex | Presentation | Associated condition/ predisposing cause | Treatment | Duration of treatment | Outcome | Susceptible antibiotics | Resistant antibiotics |
|------------------|---------|--------------|------------------------------------------|------------|----------------------|---------|------------------------|----------------------|
| Our case         | 9 years/ Female | Infective endocarditis | Crohn’s disease, TPN, CVL | Piperacillin/ tazobactam | 6 weeks | NED | Ceftazidime, piperacillin, tazobactam, Cefepime, Ciprofloxacin, Levofloxacin | NA |
| Bayhan et al (2015) [3] | 72 months/ Male | Bacteremia, pneumonia | Miller-Dieker syndrome, TPN, CVL | Imipenem | 34 days | NED | Amikacin, gentamicin, trimethoprim-sulfamethoxazole, and meropenem | Piperacillin/ tazobactam, aztreonam, and colistin. In total, 15% and 85% of the isolates were resistant to ciprofloxacin and ceftazidime, respectively |
| Bayhan et al (2015) [3] | 29 months/ Male | Bacteremia | Tetralogy of Fallot, CVL | Imipenem | 7 days | NED | | |
| Otto et al (2013) [2] | 63 years/ Male | Bacteremia | CVL | Piperacillin | 7 days | NED | Amoxicillin, amoxicillin-clavulanate, ticarcillin, ticarcillin-clavulanate, piperacillin, piperacillin-tazobactam, cephalexin, cefotaxime, ceftazidime, cefepime, aztreonam, imipenem, ertapenem, meropenem, gentamicin, amikacin, tobramycin, netilmicin, ciprofloxacin, levofloxacin, pefloxacin, rifampicin, fosfomycin, tigecycline, and colistin | NA |
| Wen et al (2013) [1] | 14 years/ Male | Sepsis | CVL | Ceftriaxone | 14 days | NED | NA | NA |
The regimen was shifted to piperacillin/tazobactam 2.3 g i.v. every 8 h and continued for 6 weeks. Upon discharge, repeated echo showed resolved vegetation; the patient clinically improved with stable vital signs and the recovery was uneventful.

Discussion

Most cases involving P. luteola are found in individuals with predisposing factors such as the presence of a PICC line [1-3], TPN [3], continuous ambulatory peritoneal dialysis (CAPD) [4-7], trauma [5,8,9], mechanical ventilation [MV] [3,10,11], surgery [12-15], or immunocompromised state [10,13,14,16,17]. As presented in Table 2, reports on infective endocarditis were associated with the presence of a central venous line (CVL), prosthetic heart valve, rheumatic heart disease, or previous heart surgery [1-3,5,13,18]. Out of 8 cases of P. luteola infection connected with CVL, 3 were of infective endocarditis, including the case reported in this article, and only 1 case (reported by Chihab et al) was fatal [1-3,5,18].

In the present case, the definitive treatment was piperacillin/tazobactam, which was given based on the susceptibility tests. Different antibiotic regimens were reported in other cases, including imipenem, ceftriaxone, ticarcillin, gentamicin, and ciprofloxacin. This difference may be due to varying clinical approaches, antimicrobial susceptibility patterns, or the availability of antibiotics in each facility.

### Table 2 continued. Summary of *P. luteola* cases associated with central venous line (1995-2015).

| Author (yr) | Age/sex | Presentation | Associated condition/ predisposing cause | Treatment | Duration of treatment | Outcome | Susceptible antibiotics | Resistant antibiotics |
|-------------|---------|--------------|------------------------------------------|-----------|----------------------|---------|------------------------|----------------------|
| Casalta et al (2005) [18] | 53 years/ Male | Infective endocarditis | Prosthetic valve | IV ticarcillin + clavulanic acid for 60 days and gentamicin for 15 days | 60 days | NED | Ampicillin, ureidopenicillin, third generation cephalosporins, fluoroquinolones, and aminoglycosides | NA |
| Chihab et al (2004) [13] | 13 years/ Male | Infective endocarditis | Rheumatic heart disease, Mitral valve replacement surgery | Ceftriaxone | 3 days | Death | Imipenem, colistin, ofloxacin, ciprofloxacin, ceftaxime, ceftazidime, ceftriaxone, and doxycycline | Amoxicillin, cephalothin, and trimethoprim-sulfamethoxazole |
| Rahav et al (1995) [5] | 26 years/ Female | Bacteremia | Trauma, splenectomy, Neurosurgery, CVL | Ciprofloxacin | 75 days | NED | Ampicillin (25%), Cefotaxime (100%), Ceftazidime (100%), Cefsulodin (75%), Mezlocillin (100%), Aztreonam (75%), Imipenem (100%), Tetracycline (25%), Cotrimoxazole (25%), Ciprofloxacin (100%), Gentamicin (100%), Amikacin (100%) | Ampicillin (75%), Cephalothin (100%), Cefuroxime (100%), Cefsulin (25%), Aztreonam (25%), Tetracycline (75%), Cotrimoxazole (75%) |

NED – no evidence of disease; NA – not available; TPN – total parenteral nutrition; CVL – central venous line.

### Treatment and Outcome

The regimen was shifted to piperacillin/tazobactam 2.3 g i.v. every 8 h and continued for 6 weeks. Upon discharge, repeated echo showed resolved vegetation; the patient clinically improved with stable vital signs and the recovery was uneventful.
The median duration of treatment of patients with infective endocarditis who had uneventful recovery was 34 days (minimum of 7 days, maximum of 75 days) [1-3,5,18]. Rahav et al and Casalta et al found that patients with valvular prosthesis had a longer duration of recovery (average of 67.5 days), compared to patients with CVL (20.8 days), and Chihab et al reported a case with a prosthetic valve that resulted in death [5,13,18], which might be a prognostic factor for cases with a prosthetic valve. Furthermore, the definitive treatment of cases with positive cultures of the CVL tip, besides the appropriate antibiotics, was removal of the catheter regardless of type. In our case, PICC line tip culture showed a significant growth of P. luteola (>15 CFU/plate by roll plate method [19]), which was similarly presented by Otto et al and Dharmayanti et al [2,11]. In the present case and previous cases, the removal of the CVL along with the appropriate antibiotics regimen lead to excellent outcomes.

An outstanding finding in the present case is the 0.8-1.0 mm vegetation in the heart valve that was discovered by echo. Similar findings were found in 2 other cases. The first case was presented by Chihab et al, in which echo revealed mitral valve deficiency without vegetation, but vegetation appeared on the prosthetic mitral valve after 6 days of admission [13]. The second case was presented by Casalta et al, in which echo revealed a 3-cm vegetation with grade 4 valvular regurgitation of the prosthetic aortic valve [18].

The present case showed a vegetation of the right side of the heart, while the other 2 cases, presented by Chihab et al and Casalta et al, had vegetations of the left side of the heart. This means that the side of the heart involved can differ according to the predisposing factor, as in the present case right heart in which involvement could be explained by the long-term use of a CVL, while the other 2 cases with left heart involvement were predisposed by the presence of a prosthetic mitral valve and a rheumatic heart disease in the case presented by Chihab et al, and prosthetic aortic valve alone as presented by Casalta et al [13,18]. Regarding the cases associated with CVL or infective endocarditis, it was found that cases with heart valve involvement required more aggressive treatment and longer duration compared to cases of CVL without heart valve involvement. Cases with heart valve involvement required a mean of 67.5 days of treatment, while recovery in cases without documented valvular pathology only took a mean of 20.8 days. Also, even though infective endocarditis with valvular vegetation was present in 3 cases only, 1 case was fatal, making P. luteola infections with heart valve involvement a serious condition in predisposed patients.

Conclusions

P. luteola can be involved in serious infections in susceptible individuals. Serious outcomes may be associated with infective endocarditis, especially on a background of valvular prosthesis and central lines. The definitive treatment of catheter-related infective endocarditis caused by P. luteola is the removal of the lines along with an appropriate antibiotic regimen-based AST result.

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