Case Report

Rapid severe sepsis from *Pseudomonas fluorescens/putida* bacteremia due to skin and soft tissue infection – A case report

Pratishtha Singh *, Andreas Montano, Adam Bostick

Department of Internal Medicine, Grand Strand Medical Center, Myrtle Beach, SC, USA

**ABSTRACT**

**Introduction:** *Pseudomonas fluorescens* (*P. fluorescens*) and *Pseudomonas putida* (*P. putida*) are uncommon causes of skin and soft tissue infections (SSTIs). They are rarely associated with bacteremia and fatality. When presenting with sepsis/shock, patients are usually immunocompromised. Our case highlights the importance of early recognition, source control and antimicrobial choice.

**Case presentation:** We present a case of an immunocompetent 57 year old female who presented with rapidly progressive septic shock in the setting of *P. fluorescens/putida* bacteremia. The patient continued to deteriorate despite empiric antimicrobial coverage and aggressive source control.

**Clinical discussion:** *P. putida* and *P. fluorescens* are gram negative bacillus bacteria that are ubiquitous in soil and water however have been reported as an opportunistic human pathogen capable of causing nosocomial infection especially in immunocompromised patients. Patients with bacteremia and shock should initially be covered with broad antimicrobial coverage for gram positive, gram negative as well as gas producing organisms and deescalate based on cultures and sensitivities. Along with antibiotics, aggressive source control is found to be the key to successful treatment in these patients.

**Conclusion:** Our case highlights an immunocompetent patient with rapid progressive sepsis and associated multisystem organ failure. We emphasize the importance of early recognition in these patients and treatment with appropriate antimicrobial therapy followed by source control.

---

1. **Introduction**

*Pseudomonas fluorescens* (*P. fluorescens*) and *Pseudomonas putida* (*P. putida*) are uncommon causes of skin and soft tissue infections (SSTIs). Both are gram-negative bacillus related to *P. aeruginosa* and are found throughout the natural environment. Several case reports in the literature are notable for bacteremia however virulence is low and fatality is rare. A majority of the patients affected by the above mentioned are noted to be in an immunocompromised state or have comorbidities that lead to a blunted immune response [1].

2. **Case report**

A 57 year old female with no pertinent family history and a past medical history of hypertension (on amlodipine), hyperlipidemia (on atorvastatin), irritable bowel syndrome and gastroesophageal reflux disease (on famotidine) initially presented to the emergency department (ED) with complaints of right lateral ankle pain. She had reported an ankle injury 12 hours prior to presentation in her condominium non-salt water pool. Within eight hours of the injury, she developed significant pain, noted swelling on the lateral aspect and presented to the ED for further evaluation. Physical exam of the right lower extremity revealed lateral malleolar edema without acute osseous findings (Figs. 1 and 2). The patient was discharged home after supportive care.

Six hours after discharge from her initial ED visit, the patient and her husband noticed worsening swelling of her right lower extremity. The previously noticed ecchymotic lesion started to expand and become more painful. The patient then developed shortness of breath and emergency medical services were contacted. The patient had a cardiac arrest due to hypoxic respiratory failure enroute to the hospital and was intubated in the field. Upon her subsequent evaluation in the ED, her vital signs were significant for hypotension 85/57 mmHg, sinus tachycardia to 115 bpm, and she was mechanically ventilated. Her physical
Initial laboratory findings showed a white blood cell count of 3.3 K/mm³ (3.7–10.1), hemoglobin of 8.9 gm/dL (11.6–15.4), mean corpuscular volume of 112.8 fL (80–100), platelet count of 36 K/mm³ (156–352). Her chemistry was significant for potassium 5.1 mmol/L (3.5–5.1), carbon dioxide 11 mmol/L (22–32), anion gap 33 mEq/L (3–45), creatinine 2.9 mg/dL (0.7–1.5), lactic acid 21.4 mmol/L (0.7–2.1), total bilirubin 1.7 mg/dL (0.1–1.1), aspartate transaminase 327 U/L (15–46), alanine transaminase 164 U/L (13–69), troponin of 0.110 ng/mL (0.0–0.034). Her coagulation studies revealed an elevated prothrombin time of 25.9 seconds (9.8–13.9), international normalized ratio of 2.25, fibrinogen 318 mg/dL (224–424) and a d-dimer 5200 ng/mL (0–500). Her creatinine kinase levels were noted to be at 3197 U/L (range 30–170). Her arterial blood gas findings were consistent with a metabolic acidosis with pH 6.69, pCO₂ 69.1 mmHg, HCO₃ 8.3 mmol/L (obtained on 100% fraction of inspired oxygen on mechanical ventilator). Her chest x-ray showed clear lungs with an endotracheal tube in place. A head computed tomography (CT) showed a small volume left inferior sylvian fissure subarachnoid hemorrhage. A chest CT angiography did not show evidence of pulmonary embolism.

The patient was admitted to the intensive care unit for workup and treatment of septic shock. Intravenous fluids with 0.9% normal saline was initiated. Blood cultures were obtained prior to initiation of intravenous antibiotics and general surgery was emergently consulted for evaluation of necrotizing fasciitis. She was initiated on empiric coverage with intravenous vancomycin (15mg/kg every 8 hours), meropenem (1 gm every 8 hours) and clindamycin (600mg every 8 hours) for necrotizing fasciitis coverage. A bedside fasciotomy of her right lower extremity (RLE) was performed followed by a bedside below the knee guillotine amputation for aggressive source control given her clinical deterioration. Tissue cultures were obtained and sent for bacterial, fungal and acid fast bacillus. A second set of blood cultures were obtained after amputation. The patient continued to have progression of her acidosis and nephrology was consulted for initiation of continuous renal replacement therapy (CRRT).

Unfortunately, her clinical status continued to deteriorate with worsening acidosis, requiring multiple pressors, and the patient shortly expired despite aggressive resuscitative efforts on the second hospital day due to multisystem organ failure. On the second day, blood cultures and tissue cultures grew *P. fluorescens* and *P. putida*. Both organisms were sensitive to piperacillin/tazobactam, gentamicin, tobramycin and meropenem.

### 3. Discussion

*P. putida* and *P. fluorescens* are gram negative bacillus bacteria that are ubiquitous in soil and water however have been reported as an opportunistic human pathogen capable of causing nosocomial infection especially in immunocompromised patients. Clinical data on both organisms is lacking owing to the rarity and relatively low virulence rate [2]. A series of case reports by Yang et al. described *P. putida* related infections and only 5% were SSTIs of which 80% were associated with trauma [3]. In 2017, Nishimura et al. identified three case reports of *P. fluorescens* infections related to contaminated infusions and an immunocompromised oncology patient [4]. Both *P. fluorescens* and *P. putida* rarely result in bacteremia, shock or mortality hence risk factors for all patients should be identified. Immunosuppression, contaminated blood product infusions or catheter related bloodstream infections are the most common cause of infections with these isolates [3].
Pseudobacteremia secondary to contamination of blood cultures during venipuncture, in the preparation of culture media, or during laboratory processing of the culture has been reported and should be considered. Blood cultures should be repeated to establish a true blood stream infection [5].

When presenting with bacteremia and associated shock, signs and symptoms related to organ hypoperfusion should be identified. These include but are not limited to tachycardia, dyspnea, restlessness, diaphoresis, metabolic acidosis, hypotension, oliguria, and cool, clammy skin. Signs of end organ dysfunction should be evaluated. Progressive shock can lead to irreversible organ damage, multiorgan failure (MOF), and death. During this stage, anuria and acute renal failure develop, acidemia further depresses cardiac output, and hypotension becomes severe and recalcitrant to therapy [6]. Diagnosis can be made with blood cultures and tissue samples from the suspected source of SSTI. Other laboratory work should include a complete blood count, comprehensive metabolic panel, lactic acid levels, an arterial blood gas as well as other labs indicated based on patients presenting symptoms.

Patients with bacteremia and shock should initially be covered with broad antimicrobial coverage for gram positive, gram negative as well as gas producing organisms and deescalate based on cultures and sensitivities. A study by von Graevenitz et al. looked at patients with positive cultures for P. putida and P. fluorescens which showed sensitivity of the two species to polymyxin colistin, aminoglycosides, tetracycline, higher generation cephalosporins, piperacillin/tazobactam and carbapenems [2]. However, there have been studies that show multi drug resistant species to carbapenems exist [2]. Along with antibiotics, aggressive source control was found to be the key to successful treatment in these patients [7]. Our patient underwent a bedside fasciotomy followed by an above the knee amputation. For worsening acidemia combined with acute renal failure nephrology was consulted and CRRT was initiated.

Although there is lacking data, literature identifies two lethal cases of bacteremia from P. fluorescens and P. putida. Both patients were noted to be immunocompromised or have various other comorbidities [1,4]. When diagnosed early, treatment with appropriate antibiotics and source control leads to improved outcomes. However, patients with multisystem organ failure tend to have a poor prognosis. Despite aggressive source control and broad antimicrobial coverage, our patient expired due to the severity of her illness and associated multisystem organ failure.

4. Conclusion

P. fluorescens and P. putida are uncommon causes SSTIs rarely resulting in bacteremia and fatality. Very few cases have been reported and most respond well to appropriate antimicrobial therapy. A few lethal cases have been identified however patients were reported to be immunocompromised. Our case above highlights an immunocompetent patient with rapid progressive sepsis and associated multisystem organ failure. We emphasize the importance of early recognition in these patients and treatment with appropriate antimicrobial therapy followed by source control.

Author contributions

All authors contributed to this manuscript. P. Singh is the article guarantor.

Financial disclosure

None to report.

Informed written consent was obtained for this case report.

Annals of medicine and surgery

The following information is required for submission. Please note that failure to respond to these questions/statements will mean your submission will be returned. If you have nothing to declare in any of these categories then this should be stated.

Please state any conflicts of interest

All authors must disclose any financial and personal relationships with other people or organisations that could inappropriately influence (bias) their work. Examples of potential conflicts of interest include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding.

The authors declare no conflict of interest.

Please state any sources of funding for your research

All sources of funding should be declared as an acknowledgement at the end of the text. Authors should declare the role of study sponsors, if any, in the collection, analysis and interpretation of data; in the writing of the manuscript; and in the decision to submit the manuscript for publication. If the study sponsors had no such involvement, the authors should so state.

This study has not received any funding.

Ethical approval

Research studies involving patients require ethical approval. Please state whether approval has been given, name the relevant ethics committee and the state the reference number for their judgement.

This study was approved by Ethics Committee.

Consent

Studies on patients or volunteers require ethics committee approval and fully informed written consent which should be documented in the paper.

Authors must obtain written and signed consent to publish a case report from the patient (or, where applicable, the patient’s guardian or next of kin) prior to submission. We ask Authors to confirm as part of the submission process that such consent has been obtained, and the manuscript must include a statement to this effect in a consent section at the end of the manuscript, as follows: “Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request”.

Patients have a right to privacy. Patients’ and volunteers’ names, initials, or hospital numbers should not be used. Images of patients or volunteers should not be used unless the information is essential for scientific purposes and explicit permission has been given as part of the consent. If such consent is made subject to any conditions, the Editor in Chief must be made aware of all such conditions.

Even where consent has been given, identifying details should be omitted if they are not essential. If identifying characteristics are altered to protect anonymity, such as in genetic pedigrees, authors should provide assurance that alterations do not distort scientific meaning and editors should so note.

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Please specify the contribution of each author to the paper, e.g. study concept or design, data collection, data analysis or interpretation, writing the paper, others, who have contributed in other ways should be
listed as contributors.

- Study concept or design – PS, AM
- Data collection – PS, AM
- Data interpretation – PS, AM
- Literature review – PS
- Drafting of the paper – PS, AM
- Editing of the paper – PS, AM, AB

Registration of research studies

In accordance with the Declaration of Helsinki 2013, all research involving human participants has to be registered in a publicly accessible database. Please enter the name of the registry and the unique identifying number (UIN) of your study.

You can register any type of research at http://www.researchregistry.com to obtain your UIN if you have not already registered. This is mandatory for human studies only. Trials and certain observational research can also be registered elsewhere such as: ClinicalTrials.gov or ISRCTN or numerous other registries.

1. Name of the registry: Not Applicable
2. Unique Identifying number or registration ID: N/A
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): N/A

Guarantor

The Guarantor is the one or more people who accept full responsibility for the work and/or the conduct of the study, had access to the data, and controlled the decision to publish.

Pratishtha Singh, M.D.

References

[1] B.S. Thomas, K. Okamoto, M.J. Bankowski, T.B. Seto, A lethal case of Pseudomonas putida bacteremia due to soft tissue infection, Infect. Dis. Clin. Pract. 21 (3) (2013) 147–213, https://doi.org/10.1097/IPC.0b013e318276956b.
[2] S.E. Kim, S.H. Park, H.B. Park, et al., Nosocomial Pseudomonas putida bacteremia: high rates of carbapenem resistance and mortality, Chonnam Med J 48 (2) (2012) 91–95, https://doi.org/10.4068/cmj.2012.48.2.91.
[3] C.H. Yang, T. Young, M.Y. Peng, et al., Clinical spectrum of Pseudomonas putida infection, J. Formos. Med. Assoc. 95 (1996) 754–761.
[4] T. Nishimura, K. Hattori, A. Inoue, et al., Bacteremia or pseudobacteremia? Review of Pseudomonas fluorescens infections, World J Emerg Med 8 (2) (2017) 151–154, https://doi.org/10.5847/wjem.j.1920-8642.2017.02.013.
[5] A. Whyte, C. Lafong, J. Malone, B.P. Golda, Contaminated lithium heparin bottles as a source of pseudobacteremia, J. Hosp. Infect. 42 (4) (1999) 342–343.
[6] M. Singer, C.S. Deutschman, C.W. Seymour, et al., The third international consensus definitions for sepsis and septic shock (Sepsis-3), J. Am. Med. Assoc. 315 (2016) 851.
[7] Tram-Anh Duong, Taran Silva, Patrick McKillion, A second reported fatal case of Pseudomonas putida septicemia from soft tissue infection, Crit. Care Med. 47 (1) (2019) 289, https://doi.org/10.1097/01.ccm.0000551369.47016.e9.