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A Lethal Case of *Pseudomonas putida* Bacteremia Due to Soft Tissue Infection

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Abstract

Pseudomonas putida is an uncommon cause of skin and soft tissue infections. It is often associated with trauma or immunocompromised state. We present the first lethal case of bacteremia due to skin and soft tissue infections, which had malnutrition, immobility, and peripheral vascular disease as risk factors.

Keywords

Pseudomonas putida; sepsis; cellulitis; soft tissue infection

P*seudomonas putida*, a member of the fluorescent group of pseudomonads, is a flagellated, gram-negative rod that is found throughout the natural environment. Case reports in the literature describe a wide range of conditions that have led to *P putida* bacteremia, including pneumonia,[1,2] catheter-related blood stream infections,[1-4] acute cholecystitis[3,5] and cholangitis,[3] tonsillitis,[2] thrombophlebitis,[2] and skin and soft tissue infections (SSTIs).[2,6-8]

To our knowledge, we present the first lethal case of *P putida* bacteremia due to soft tissue infection even with appropriate antimicrobial therapy.

CASE REPORT

An 80-year-old Native Hawaiian woman presented with a history of decreased appetite, weight loss, and progressive decline in mental status over a period of 1 week. Medical history was remarkable for chronic renal insufficiency and peripheral vascular disease with a chronic nonhealing ulcer to the medial left lower extremity. In the prior week, she developed an ulcerated lesion (1 cm in diameter) to the right lateral epicondyle of the humerus. Owing to her deteriorating mental status, family members urged that she seek medical care. The patient's history did not reveal any special exposures or travel history, and review of her systems did not reveal any other potential source for her infection.

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Physical examination of the left lower extremity revealed a dried nonhealing ulcer (5 cm in diameter) without evidence of active infection. Additionally, an ulcerated lesion (1 cm in diameter) to the lateral epicondyle of the right humerus was identified. Surrounding erythema, warmth, tenderness, and swelling were present. Minimal amounts of purulent drainage were expressed and sent for bacterial culture.

Initially, the patient was hypothermic (32.1°C) and normotensive. However, after several hours in the emergency department, she became hypotensive with a blood pressure of 71/>50 mm Hg (heart rate, 113 beats per minute). Laboratory data included the following: white blood cell count, 15,200/mm^3; hematocrit, 42.1%; platelet count, 141,000/mm^3; International normalized ratio, 1.8; lactic acid, 3.2 mEq/L; glucose, 30 mg/dL; serum urea nitrogen, 90 mg/dL; creatinine, 3.6 mg/dL (baseline creatinine, 3.0 mg/dL), albumin, 2.4 g/dL; and a prealbumin of less than 3 mg/dL. Chest x-ray obtained on admission revealed bilateral pleural effusions (right greater than left) without any infiltrates. Urinalysis showed no evidence of infection. Radiography of the left lower extremity revealed a soft tissue swelling without evidence of osteomyelitis.

Empiric antibiotic therapy with cefepime and vancomycin was initiated, and the patient was transferred to the medical intensive care unit for vasopressor support. The patient was rewarmed and given empiric stress dose steroids for possible adrenal insufficiency (because a random cortisol level was within normal limits, suggestive of inadequate response).

Blood cultures obtained upon hospital admission revealed growth in 1 of 2 bottles (ie, aerobic bottle) within 24 hours. Bacterial culture revealed an oxidase positive, nonfermenting gramnegative bacillus with biochemical identification resembling a *Pseudomonas* species. Furthermore, identification was accomplished using 16S rRNA sequencing (capillary electrophoresis; MicroSeq 500 [Applied Biosystems, Foster City, Calif]) with sequence analysis accomplished using the RipSeq Single (Isentio, Norway) software program.

Bacterial identification by 16S rRNA gene analysis revealed *P putida* as the causative organism. The wound culture (right lateral epicondyle) and urine culture did not reveal any other pathogenic organisms. Additionally, methicillin-resistant *Staphylococcus aureus* nasal screening was also negative. The *P putida* isolate was susceptible to amikacin, cefepime (4 μg/mL), ciprofloxacin, gentamicin, levofloxacin, piperacillin/tazobactam, and tobramycin. It was intermediate to ceftriaxone and resistant to chloramphenicol, piperacillin, ticarcillin/clavulanate, and trimethoprim/sulfamethoxazole.

Despite aggressive resuscitative efforts, the patient died on the third hospital day owing to refractory septic shock and multiorgan failure.

DISCUSSION

P putida is not commonly isolated from soft tissue infections. This is evidenced by the paucity of cases reported in the literature (Table 1). Yang et al described a series of *P putida*–related infections over a 5-year period, and SSTIs represented only 5% (3/55) of their isolates. Of the cases with clinical information described, 80% (4/5) were associated with trauma, and the other case may have had an inoculating event given that they contracted the illness from wading through flood water.[2,6,7] Bacteremia was present in only 1 of the 5 prior cases with information available, and appropriate antimicrobial therapy resulted in a good clinical outcome in all patients. Additionally, source control may be an important component in the treatment of *P putida* SSTIs. Eleven serial debridements were required in one case of wound infection despite the use of proper antibiotics.[6] Overall, surgical intervention was performed in two thirds of cases; and in the only case with a poor

outcome (current case), surgery was not performed. Although *P putida* was not isolated from the wound, perhaps due to it being mostly necrotic tissue without viable organisms, the patient had no other discernible focus of infection, and blood cultures were positive for this organism.

P putida bacteremia is also an uncommon event. Yoshino et al described a series of cases of *P putida* bacteremia, and it accounted for only 0.22% of isolates at their institution over a 4-year period. Reported a total of 28 times in the literature, it is typically associated with an indwelling device (61.9%) or immunocompromised state (85.7%), and the prognosis is considered favorable with 92.9% cured with appropriate antimicrobial therapy (out of 28 total cases).[3] Source control (ie, device removal) may account for this finding because most cases were device related.

The current case of *P putida* bacteremia due to soft tissue infection revealed fulminant sepsis-induced multiorgan failure resulting in death. As previously noted, most patients with infections due to *P putida* have a mucocutaneous defect or underlying compromised immunity. In the present case, immobility and peripheral vascular disease were the elements responsible for the development of a cutaneous defect. In addition, advanced age and malnutrition, which are known causes of a blunted immune response and impaired host defenses, likely influenced the patient's poor outcome despite aggressive treatment. The patient also had chronic renal insufficiency, which could have impaired her immunological function. She otherwise had no apparent risk factors, such as HIV infection or immunosuppression, which would have potentially impaired the immune response. The patient did receive appropriate antimicrobial coverage for *P putida* infection. However, the patient was too unstable to consider any surgical intervention for source control.

This report highlights an aggressive case of *P putida* bacteremia due to SSTIs. Given that the patient's comorbidities are commonly found in the nursing home and long-term care facility populations, we hypothesize that *P putida* may be increasingly identified in patients with poor functional status, malnutrition, and immobility. In addition, evidence suggests that although *P putida* infections generally have a good outcome, aggressive source control may be a key component to success.

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TABLE 1

Summary of Cases of *Pseudomonas putida* SSTIs

Reference	Case	Risk Factor(s)	Location	Bacteremia	Antibiotics/Appropriate	Surgical Intervention	Outcome
Yang et al[2]	1	Trauma	NR	No	NR	Yes	S
	2	Trauma	NR	No	NR	Yes	S
	3	Trauma	NR	No	NR	Yes	S
Lombardi et al[8]	4	NR	NR	NR	NR	NR	NR
	5	NR	NR	NR	NR	NR	NR
Chen et al[7]	6	Flood water	Bilateral lower extremities	Yes	Ceftazidime/Yes	No	S
Carpenter et al[6]	7	Trauma, Blast injury	Right leg stump	No	Meropenem/Yes	Yes	S
Current	8	Immobility, malnutrition, PVD	Right upper extremity	Yes	Cefepime, vancomycin/yes	No	D

D indicates died; F, female; M, male; NR indicates not reported; PVD, peripheral vascular disease; S, survived.

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