Necrotizing fasciitis in an immunocompromised elderly woman

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CASE PRESENTATION

An 85-year-old woman presented to hospital with a rapidly progressing erythema of the lower left leg. The patient was well until several hours before admission when she noted a small area of painful erythema on her left shin that progressed over 2 h to involve the entire leg below the knee. There had been no erythema noted earlier that day when her daughter bathed her. Her medical history was significant for hypertension, congestive heart failure, remote left total knee arthroplasty and a recent diagnosis of temporal arteritis for which 40 mg of prednisone daily was prescribed. She had no recent travel history and no sick contacts.

On presentation, the patient appeared well, was not in distress and was hemodynamically stable with a heart rate of 80 beats/min, blood pressure of 120/60 mmHg and a temperature of 36.7°C. Her physical examination was remarkable for erythema over the anterior lower left leg, extending around the calf. There were no bullae. Although the leg was tender to palpation, the pain was not out of proportion with the area of erythema. There was no crepitus, and no ulcers or ports of entry were apparent. No regional lymphadenopathy was present. Examination of the left knee found no warmth, effusion or erythema, and there was complete and pain-free range of motion. The remainder of her physical examination was unremarkable.

Initial investigations revealed a hemoglobin level of 146 g/L, a leukocyte count of $6.5 \times 10^9/L$, a platelet count of $146 \times 10^9/L$ and a creatinine level of 51 $\mu\text{mol/L}$. Venous Doppler ultrasound of the left leg showed no evidence of deep vein thrombosis. Blood cultures were obtained before the patient was started on empirical intravenous antibiotic therapy with cefazolin (1 g every 8 h) and clindamycin (600 mg every 8 h).

After 24 h of therapy, the erythema of the leg improved; however, severe foot pain developed in the absence of any erythema. She remained hemodynamically stable with a blood pressure of 140/80 mmHg and a heart rate of 80 beats/min and remained afebrile with a temperature of 36.5°C but had a notable drop in her leukocyte count to $1.8 \times 10^9/L$. Her creatine kinase level (26 U/L) was normal (normal <150 U/L). Due to the confusing clinical picture and in light of her immunocompromised status, antibiotic coverage was broadened by discontinuing cefazolin and starting piperacillin/tazobactam (4.5 g every 8 h).

Approximately 36 h after admission, she acutely deteriorated, developing fever (37.9°C), hypotension (80/60 mmHg), a decreased level of consciousness, and worsened edema and erythema of the left leg extending above the knee with multiple small foci of necrosis. She required transfer to the intensive care unit for inotropic support. Vancomycin was added to the piperacillin/tazobactam and clindamycin, intravenous immunoglobulin was given, and an urgent orthopedic surgery consultation was obtained. A fascial biopsy was performed, which was sent for frozen section and culture. The biopsy was consistent with necrotizing fasciitis (NF) and the patient was taken to the operating room for urgent debridement, where an above-knee amputation was performed. Postoperatively, the patient experienced ongoing hypotension and a new area of erythema over the upper left thigh extending to

the abdomen. The piperacillin/tazobactam was discontinued and meropenem was added. The next day, there was growth in the tissue culture from the fascial biopsy. What was the causative organism?

Diagnosis

Culture of the tissue produced heavy growth of *Serratia marcescens* as the sole identified pathogen. It was sensitive to ciprofloxacin, gentamicin, and trimethoprim/sulfamethoxazole, while resistant to all penicillins and cephalosporins. Blood and urine cultures remained negative.

Postoperatively, the patient stabilized hemodynamically and was taken off inotropic support shortly after being started on meropenem. However, she continued to require intubation and was found to have additional areas of erythema above her amputation and on her abdomen. On review with her family, they declined further surgical exploration and debridement; the areas of erythema did not expand and she remained hemodynamically stable on meropenem. However, the patient developed additional nosocomial complications, including candidemia, and died after a 28-day admission to the intensive care unit.

DISCUSSION

NF is a relatively rare, but severe, soft tissue infection that spreads along fascial planes with associated inflammation and necrosis. Even with optimal treatment, the overall mortality rate is 15% to 20% (1). NF is typically classified based on the microbial source of infection: type I is due to polymicrobial infection, usually consisting of Gram-positive cocci, Gram-negative bacilli and anaerobes; and type II is monomicrobial and caused by Group A streptococcus. However, other monomicrobial causes of NF have been reported. A review of the English literature revealed eight published cases of NF caused by *S. marcescens* as the sole pathogen.

S. marcescens is a Gram-negative bacillus and member of the *Enterobacteriaceae* family. It is a saprophytic bacterium that is ubiquitous in the environment; however, it can cause nosocomial infection, more commonly in immunocompromised patients. It has been implicated in a variety of infections, including pneumonia, urinary tract infections, endocarditis, meningitis and wound infection (2).

S. marcescens is typically resistant to β -lactams due to production of chromosomal AmpC cephalosporinase (2). Thus, antibiotic therapy for *S. marcescens* infections should include a carbapenem, a fluoroquinolone or an aminoglycoside. As in all cases of NF, prompt source control of the infection by aggressive surgical debridement is imperative (3).

We summarized the previously published cases with *S. marcescens* as the sole pathogen responsible for NF (Table 1). Our presented case, along with review of previous cases, emphasizes the need for an increased index of suspicion for this less common but more resistant etiological agent of NF in specific circumstances. Seven of the nine cases occurred in hosts who were immunocompromised in some form. Of the cases in which infection did not subside, the majority did not receive a carbapenem, a fluoroquinolone or an aminoglycoside. Therefore, we suggest consideration of *S. marcescens* among patients with NF who are immunocompromised and experience progressive infection despite

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TABLE 1
Summary of previously published cases of necrotizing fasciitis caused solely by *Serratia marcescens*

Author (reference), year	Age/sex	Site	Immune status	Antibiotics used	Outcome
Rimailho et al (4), 1987	74/male	Right leg	Competent	Penicillin	Died
Bornstein et al (5), 1992	37/female	Right axilla and breast	Competent	Penicillin, vancomycin, ciprofloxacin, amikacin	Died
Zipper et al (6), 1996	55/female	Right ankle/leg	Compromised (diabetes mellitus)	Ceftizoxime, clindamycin	Recovered
Huang et al (7), 1999	40/male	Left foot	Compromised (prednisone)	Ceftazidime	Recovered
	73/male	Right leg	Compromised (prednisone)	Ciprofloxacin	Recovered
Liangpunsakul and Pursell (8), 2001	66/female	Left ankle/leg	Competent	Penicillin, clindamycin, ceftriaxone	Died
Dubberke et al (9), 2002	35/male	Right arm	Compromised (chemotherapy)	Vancomycin, cefepime, gentamicin, imipenem, clindamycin, ciprofloxacin	Recovered
Bachmeyer et al (10), 2004	49/male	Right leg	Compromised (chemotherapy)	Piperacillin/tazobactam, amikacin,	Cellulitis and wound recovered, but died of SCLC
Curtis et al, (3) 2005	51/male	Left leg	Compromised (diabetes mellitus)	Vancomycin, ciprofloxacin, clindamycin, aztreonam	Died
Ghosh and Johnstone, 2013	85/female	Left leg	Compromised (prednisone)	Cefazolin, piperacillin/tazobactam, meropenem	Died

SCLC Small cell lung cancer

broad-spectrum β -lactam or cephalosporin therapy and aggressive surgical debridement. One other case (3) reported fresh water exposure before infection, as did our patient, suggesting that this may be an important historical clue.

The present case also illustrates the importance of obtaining tissue cultures in establishing an etiological agent in NF.

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