Bullous Cellulitis Caused by *Serratia marcescens*

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Bullous cellulitis is a distinctive form of cellulitis most often caused by beta hemolytic streptococci. This report describes a case of bullous cellulitis caused by *Serratia marcescens* in an elderly diabetic woman with peripheral vascular disease. A discussion of this ubiquitous, nosocomial pathogen follows.

**CASE REPORT**

A 69-year-old First Nations female with type II diabetes mellitus, coronary artery disease, and peripheral vascular disease presented to a northern medical station following a 1-week history of pain and erythema of her left foot that was associated with fever and chills. Forty-eight hours after onset of the fever, two large, purple bullae developed in the area of cellulitis on the dorsum of the left foot and the anterior surface of the distal left leg. At that time, empirical treatment with intravenous cindamycin and gentamicin was initiated. The patient denied further fever; however, she continued to experience significant discomfort in her left foot. This pain was partially relieved with dependency of the foot. Concerns over poor response to therapy prompted transfer to the Health Sciences Centre, Winnipeg. Past pertinent medical history included removal of an ingrown and chronically infected left great toenail 1 month prior to presentation. The patient received no perioperative antimicrobial therapy; however, she did soak her toe in chlorhexadine, an antiseptic solution. Additionally, she complained of intermittent claudication of both her calves, but denied rest pain. She did not have a past history of diabetic foot ulcers.

Upon presentation, the patient was not in distress, but complained of prominent left foot pain. Examination of the left limb revealed two tense, purple bullae, each measuring approximately 10 × 15 cm (Figure 1). One was located on the dorsum of the foot and the other on the distal medial ankle. A limited area of cellulitis surrounded the bullae. The base of the bullae was erythematous. This region was not purulent or foul smelling. Neither crepitus nor lymphangitis was noted. The great toenail was absent. The foot was cool to palpation, with diminished pulses distal to the popliteal artery. Mild pedal edema was present bilaterally. Laboratory examination revealed a leukocyte count 17.1 × 10⁹/L with a left shift of 7%, and an erythrocyte sedimentation rate of 99 mL/hr. A femoral angiogram revealed extensive peripheral vascular disease with diminished blood flow distal to the popliteal artery and no evidence of arterial thrombosis. Lower limb pressure studies of the left leg indicated severe obstruction, with low distal perfusion and a hallux-brachial systolic pressure index of 0.14. Studies of the right lower limb indicated only moderate obstruction of blood flow in the main arteries with good distal perfusion and a ratio of 0.53. Doppler ultrasound did not reveal a deep vein thrombosis and radiography did not demonstrate any bony abnormalities. Blood cultures were negative. Low viscosity, translucent, red-colored fluid was aspirated from both bullae. Gram stain of the fluid revealed 10 polymorphic leukocytes per high-power field and 10 to 100 gram-negative bacilli per high-power field. No red blood cells were noted. The sole organism isolated after aerobic and anaerobic culture from both bullae was *S. marcescens*. The antibiogram indicted resistance to ampicillin (MIC >16 µg/mL), cefazolin (MIC >16 µg/mL), and cefturoxime (MIC >16 µg/mL). The organism was sensitive to third generation cephalosporins, aminoglycosides, and ciprofloxacin (MIC < 1 µg/mL). Following identification of *S. marcescens* the patient was started on a 10-day course of ciprofloxacin. Resolution of the cellulitis began at day 7 of treatment, and the patient was discharged to the northern medical station. At the northern medical station, it was noted that despite antimicrobial therapy and meticulous wound care, the left ankle became progressively ischemic and ultimately progressed to vascular gangrene. The patient underwent a left below knee amputation 1 month after her discharge from the Health Services Centre. Her postoperative course was uncomplicated.

**DISCUSSION**

Bullous cellulitis occurs most often with beta hemolytic streptococci (*Streptococcus pyogenes*) infection and less commonly with infection due to *Staphylococcus aureus*. Secondary bullous cellulitis complicating gram-negative...
bacteremia rarely has been documented. Organisms isolated include *Pseudomonas aeruginosa*, *Escherichia coli*, *Aeromonas hydrophila*, *Morganella morgani*, *Enterobacter cloacae*, *Vibrio vulnificus*, and *Salmonella enteritidis*. Primary cases due to the above organisms have not been documented. To the authors' knowledge, *S. marcescens* previously has been associated with bullous cellulitis in a single case report. This patient was an immunocompromised male who developed a polymicrobial infection at the site of a biopsy. The present case is the first report of bullous cellulitis caused solely by *S. marcescens*. This association is supported by the fact that *S. marcescens* alone was isolated from three separate aspirations. The combination of fever, local discomfort, appearance of the region surrounding the bullae, and the Gram stain suggest that infection, rather than colonization, was present. The patient's stable clinical presentation and negative blood cultures suggest that the bullous cellulitis was primary and not secondary to bacteremic seeding of *S. marcescens* from another source.

Risk factors for infection with *S. marcescens* include chronic debilitating disease, diabetes mellitus, corticosteroid use, recent therapy with broad-spectrum antibiotics, indwelling catheters, mechanical ventilation, and tracheostomy. This patient had had diabetes for over 20 years and had been on antibiotics for cellulitis of the left great toe 1 month previously.

*Serratia marcescens* is a ubiquitous organism found in both soil and water environments. Its ecology in moist environments results in its frequent isolation as a contaminant of ventilation equipment, tracheostomy tubes, and indwelling catheters. Without appropriate precautions, normally sterile hospital solutions can become contaminated with this organism. Potential sources of infection include peritoneal dialysis fluid, enteral feeding solutions, and antiseptic solutions. *Serratia marcescens* cellulitis has been reported in a patient on hemodialysis that was presumed to be secondary to dialysate contamination. In the present case, the patient gave a history of soaking her ingrown great toe in chlorhexidine antiseptic.

Figure 1. Examination of the left foot revealed tense, purple bullae, measuring approximately 10 × 15 cm on the distal medial ankle (left) and on the dorsum (right).
tic solution approximately 3 weeks prior to her presentation with bullous cellulitis. It is speculated that her colonization and subsequent infection may have been attributable to contamination of her antiseptic solution. Unfortunately, the antiseptic solution could not be obtained for culture. Interestingly, S. marcescens is known to be resistant to chlorhexidine.12

Multidrug resistance is a well-known feature of S. marcescens. Serratia possesses a chromosomal β-lactamase that necessitates high concentrations of β-lactamase inhibitors to achieve bacteriocidal levels.13 Quinolone resistance has been attributed to outer membrane protein alterations that result in diminished antibiotic permeability.10 Aminoglycoside resistance also has been reported. Both aminoglycosides and third generation cephalosporins are regarded as first line therapy for Serratia infections.17 Oral ciprofloxacin is also recommended for serious soft tissue infections caused by this organism.19 The patient presented here was initially treated with gentamicin, resulting in resolution of her fever and chills. Subsequently, the gentamicin was discontinued and therapy with oral ciprofloxacin was initiated to complete a therapeutic course of 14 days. This decision was guided by the patient’s overall satisfactory condition, the antibiogram profile of the organism, and the advantages of an oral route of administration.

The diagnostic differential of bullous cellulitis is broad. To the authors’ knowledge, this patient represents the first case report of bullous cellulitis caused solely by S. marcescens. It is postulated that her exposure to the organism occurred while she soaked her foot in a contaminated antiseptic solution. Diabetes and recent antibiotic use were additional contributing risk factors. Empirical therapy with gentamicin, followed by ciprofloxacin resulted in resolution of the bullous cellulitis, however, vascular compromise of the leg necessitated subsequent amputation despite successful initial treatment.

REFERENCES