

Case Report

Cellulitis left lower leg secondary to *Pseudomonas aeruginosa* bacteremia: case of community -acquired infection

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ABSTRACT

The term cellulitis is commonly used to indicate a nonnecrotizing inflammation of the skin and subcutaneous tissues, usually from acute infection. *Pseudomonas aeruginosa* is a gram-negative bacillus that causes wide spectrum clinical infections. However, it is most frequently associated with hospital-acquired infection. Authors are presenting a case report of 45 years old Saudi male who presented initially with redness and hotness in the mid of right lower leg gradually increased with development of vesiculous bullae, scaling and sloughing of overlying skin. *Pseudomonas aeruginosa* was identified from the case, though it was not a usual suspected organism. It might be due to community-acquired infection. Patient was treated conservatively with I/V antibiotic and local hygienic methods including dressing with vaseline (bactigrass) and topical antibiotics. Patient improved and discharged with complete resolution of cellulitis.

Keywords: Cellulitis, Limb infection, *Pseudomonas cellulitis*, Pseudomonas infection

INTRODUCTION

The term cellulitis is commonly used to indicate a nonnecrotizing inflammation of the skin and subcutaneous tissues, usually from acute infection (see the image below). Cellulitis usually follows a breach in the skin, although a portal of entry may not be obvious; the breach may involve microscopic skin changes or invasive qualities of certain bacteria. Cellulitis usually follows a breach in the skin, such as a fissure, cut, laceration, insect bite, or puncture wound. In some cases, there is no obvious portal of entry and the breach may be due to microscopic changes in the skin or invasive qualities of certain bacteria. Organisms on the skin and its appendages gain entrance to the dermis and multiply to cause cellulitis. Facial cellulitis of odontogenic origin may also occur. Patients with toe-web intertrigo and/or tinea pedis -as well as those

with lymphatic obstruction, venous insufficiency, pressure ulcers, and obesity-are particularly vulnerable to recurrent episodes of cellulitis.¹⁻³

The vast majority of cases of cellulitis are likely caused by *Streptococcus pyogenes* and, to a lesser degree, by *Staphylococcus aureus*. In rare cases, cellulitis results from the metastatic seeding of an organism from a distant focus of infection, especially in immunocompromised individuals. Distant seeding is particularly common in cellulitis due to *S pneumoniae* (pneumococcus) and marine *Vibrio* species. *Neisseria meningitidis*, *Pseudomonas aeruginosa*, *Brucella* species, and *Legionella* species have also been reported as rare causes of cellulitis resulting from hematogenous spread.⁴

Pseudomonas aeruginosa is a gram-negative, rod-shaped, asporogenous, and monoflagellated bacterium. It has a

pearlescent appearance and grape-like or tortilla-like odour. *P. aeruginosa* grows well at 25°C to 37°C, and its ability to grow at 42°C helps distinguish it from many other *Pseudomonas* species. *P. aeruginosa* is a ubiquitous microorganism which has the ability to survive under a variety of environmental conditions.

P. aeruginosa is an opportunistic pathogen. It rarely causes disease in healthy persons. In most cases of infection, the integrity of a physical barrier to infection (e.g., skin, mucous membrane) is lost or an underlying immune deficiency (e.g., neutropenia, immunosuppression) is present. Adding to its pathogenicity, this bacterium has minimal nutritional requirements and can tolerate a wide variety of physical conditions.

The pathogenesis of pseudomonas infections is multifactorial and complex. *Pseudomonas* species are both invasive and toxigenic. The 3 stages, according to Pollack (2000), are (1) bacterial attachment and colonization, (2) local infection, and (3) bloodstream dissemination and systemic disease.^[5] The importance of colonization and adherence is most evident when studied in the context of respiratory tract infection in patients with cystic fibrosis and in those that complicate mechanical ventilation. Production of extracellular proteases adds to the organism's virulence by assisting in bacterial adherence and invasion.

Pseudomonas aeruginosa is a gram-negative bacillus that commonly colonizes hospital environment. It contaminates water and hospital devices and is known as aetiological agent of nosocomial infection. Community-acquired infection of this organism had been reported.⁶ The prevalence of *P. aeruginosa* bacteremia varies from one to other institutions and the sources of bacteremia were identified in 66 % of cases.⁷ Altogether 21% of these bacterial infections were classified as community-acquired infection.⁸

CASE REPORT

A 48-year-old Saudi male with background medical problem of hypertension and dyslipidemia presented with fever and right leg swelling for three days duration prior to admission. The fever was described as a low grade and it was associated with chills and rigors. It started together with the right leg swelling. The right leg swelling was sudden onset and it was associated with severe throbbing pain. There was no prior history of trauma and insect bite. This was his first episode of leg swelling. There was neither chest pain nor shortness of breath. On clinical examination, he was alert and conscious but febrile with body temperature of 37.5 °C. His blood pressure was normal but he was tachycardic with heart rate of 100 beats per minute. His respiratory rate was normal. Respiratory and cardiovascular system examination revealed no abnormality. Left leg examination revealed swelling of the left leg with erythematous skin. There was

no blister on admission but gradually he developed blisters and scaling of the overlying skin with whitish patches and pin point serous discharging sinuses. There was no clear demarcation with the surrounding skin. The right leg was not gangrenous, and no trauma or bite mark was seen. It was tender on palpation but there was no crepitus. The peripheral pulses were present. Ultrasound doppler of the left leg showed no evidence of deep vein thrombosis and no osteomyelitis changes of the left tibia and fibula were noted by X-ray. His total white cell count was slightly raised up to 15. The hemoglobin and platelet level were normal. His random blood sugar was within normal range. ECG showed sinus tachycardia with no other abnormality. The diagnosis of acute left leg cellulitis was made. Empirical antibiotics consisting of intravenous second generation cephalosporins, followed by tazocin (piperacillin+tazobactam) were started with symptomatic treatment.

The patient was kept in the normal ward under I/V antibiotic and in the meantime, he was completely evaluated including MRI, series of doppler and soft tissue USG of left lower leg which were in favour of uncomplicated cellulitis.



Figure 1: (A): showing initial presentation of cellulitis. (B): showing another close view with vesicular bullae and diffuse sloughing of overlying skin. (C): another view with diffuse induration sloughing and diffuse oedema of left lower leg.

The MRI revealed marked subcutaneous soft tissue thickening characteristic of cobble stone appearance with diffuse linear (septal) contrast enhancement suggestive of cellulitis but showed normal appearance of underlying

musculature with intact fat planes with no evidence of intramuscular abnormal signals.

There was no response to these antibiotics next dermatology and vascular surgery consultation were sought out and swab was taken from the sloughy area which reported as *Pseudomonas aeruginosa*.



Figure 2: (A): 2 patches on anterior and posterior aspect of left lower leg. (B): shows another clear view of both patches.



Figure 3: (A) showing regression of the infection after daily dressing with topical antibiotic with bactigrass. (B) another view.

The patient was not responding to the empirical antibiotics and they were judiciously replaced by intravenous ceftazidime 2gram 8 hourly. Subsequently, his condition improved, and the right leg cellulitis was gradually resolved. Intravenous ceftazidime was continued for 14 days. Repeated swab cultures on day 10 of treatment and before discharge were negative.

Regular daily dressing was done with local antibiotic and Vaseline gauze (bactigrass), which helped in resolving the slough formation and disappearance of the vesiculous bullae with regression of induration and swelling (Figure 3 (A) and Figure 3(B)).

Repeated cultures on day ten of treatment and before discharge were negative. He was discharged well with advice to follow up in the OPD.

DISCUSSION

Pseudomonas aeruginosa is a leading cause of nosocomial infection and associated with high mortality rate.⁹ Pneumonia and sepsis are the most common infections associated with these bacteria.¹⁰ This is a case of *Pseudomonas aeruginosa* bacteremia, which we believe might have acquired from community setting. *Pseudomonas aeruginosa* is an uncommon cause of community-acquired bacteremia. Cases of community-acquired *P. aeruginosa* bacteremia represent about 21% of all cases of *P. aeruginosa* bacteremia.⁸ Community-acquired *P. aeruginosa* infections occurred in those with specific predisposing factors such as neutropenic and chronic structural lung diseases such as cystic fibrosis and bronchitis.¹¹ In present case, authors could not find any significant risk factors that are associated with community-acquired *P. aeruginosa* infection.

From hospital-based study, *P. aeruginosa* accounted around 2.7% of all bacteremia cases and the primary source is identified in 60 to 70% of the cases, with respiratory tract as most common site of infection.⁷ Most of the time, community-acquired *P. aeruginosa* infection presents as otitis externa.⁶ *Staphylococcus aureus* and beta hemolytic streptococci are the most common aetiological agents for cellulitis and *P. aeruginosa* is not a common cause of cellulitis.¹²

P. aeruginosa was not suspected in our case at the time of presentation due to this knowledge. Skin and soft tissue infections caused by this organism can appear as primary or metastatic foci, expressed in wide presentations including cellulitis, ecthyma gangrenosum, necrotizing fasciitis and gangrene.¹³ Independent predictors of *P. aeruginosa* bacteremia in community setting were severe immunodeficiency, age >90 years, receipt of antimicrobial therapy within past 30 days, and presence of central venous catheter or urinary device.¹¹ None of these factors was identified for studied patient. Perhaps, molecular methods are the most appropriate investigational tool to identify clusters of *Pseudomonas aeruginosa* that belong to community or hospital-acquired skin and soft tissue infection in origin.⁶

Treatment of *P. aeruginosa* is always challenging because these bacteria can easily develop resistance to many classes of antibiotics. *P. aeruginosa* is known to possess many resistance genes thus it is associated with multiple mechanisms of antibiotic resistance.¹⁰ commonly exist in *P. aeruginosa*. The patient responded well to the treatment and completed the antibiotic course for 14 days. Repeated blood culture showed a negative result indicating a successful treatment.

The prognosis of *P. aeruginosa* bacteremia varies from one hospital to another. The 30-day mortality rate shown by a study in Japan was 20.9 % with thrombocytopenia and polymicrobial infections as the significantly contributing factors (Horino et al.).¹⁴ Perhaps, absence of these two factors could contribute to better outcome in our case.

CONCLUSION

Pseudomonas aeruginosa is not a common aetiological agent of community-acquired skin and soft tissue infection with bacteremia. Its infections in community should be managed cautiously particularly in high-risk populations those are immunosuppressant. Treatment of *Pseudomonas aeruginosa* infection is always challenging as the organism easily acquires resistance to different classes of antibiotics.

The purpose of presenting this case is that pseudomonas skin and soft tissue infections are rare and needs to be kept in mind while treating the skin and soft tissue infections as our patient didn't gave any history of trauma or insect bite and there was no previous history of hospitalization.

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