



Necrotizing Fasciitis Caused by *Klebsiella pneumoniae* in a Patient Undergoing Hemodialysis: A Case Report and Literature Review

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Abstract

Introduction: Necrotizing fasciitis is not rare in clinical practice, but a *Klebsiella pneumoniae*-related is rare, especially in patients undergoing hemodialysis. Many patients with necrotizing fasciitis have a miserable outcome even though they receive amputation.

Case Presentation: A 76-year-old male was initially admitted to the center due to suspected cellulitis in Taichung, Taiwan. However, the treatment response was beyond expectation, and a plain film X-ray was performed on his leg. To our surprise, it showed apparent gas and calciphylaxis. Easy examination detected the severe disease. Immediate surgical debridement was performed, and his legs and life were successfully saved, although the outcomes of the disease were miserable. The tissue culture yielded *Klebsiella pneumoniae*. This pathogen, related to necrotizing fasciitis, is rare in the currently published articles. The possible risk factors were the endemic region, diabetes mellitus, calciphylaxis, old age, frequent iron supplements, and repeated tissue hypoperfusion during hemodialysis.

Conclusion: In conclusion, meticulously and timely diagnosed necrotizing fasciitis in high-risk groups is the most important factor to ensure a positive patient outcome.

Keywords: Calciphylaxis, Cellulitis, Fasciitis, Hemodialysis, *Klebsiella pneumoniae*, Necrotizing

1. Introduction

Necrotizing fasciitis (NF) is not rare in clinical practice, but NF caused by *Klebsiella pneumoniae* (KP) is still rare. The outcome of NF is miserable in the general population, but the outcome NF caused by KP is still undefined, especially in uremic populations. Here is the report on the first case of a uremic patient with NF caused by KP. The risk factors for this patient were reviewed, and the unique characteristics of this patient were discussed. The importance of early diagnosis for such populations was highlighted; clinicians should keep in mind this diagnosis even if it is a rarity.

2. Case Presentation

A 76-year-old male had a history of coronary artery disease, type 2 diabetes mellitus (DM), and end-stage renal disease undergoing regular hemodialysis for ten years. This time, he was admitted to Taichung Veterans General Hospital in Taiwan in 2012 due to right leg erythema and swelling, for four days. He had chronic uremic pruritus

and used to scratch his leg. Right leg swelling, erythematous change, and a painful sensation were noticed. Therefore, he was admitted to the emergency department, but there was no leukocytosis or thrombocytopenia, and the hemodynamic status was also stable. However, C-reactive protein (CRP) was up to 11.9 mg/dL. Ampicillin-sulbactam was prescribed for suspected soft tissue infection. After three days of antibiotic therapy, he claimed the painful sensation, and the swelling even got worse. There were no bullae or increased area of erythema (Figure 1A), but due to unexplained painful sensations, a plain X-ray of the right lower limb was taken. Surprisingly, X-ray imaging revealed calciphylaxis and multiloculated low attenuation lesions within the soft tissue of the right middle calf (Figure 1B). Computed tomography (CT) disclosed fluid accumulation with gas formation between the tibia and fibula of the right lower leg, 156 mm in diameter, compatible with abscess formation and necrotizing fasciitis (Figure 1C, D, E, and F). After studying the images, only crepitus with very deep palpitation could be detected by examinations. The important data are summarized in Table 1.

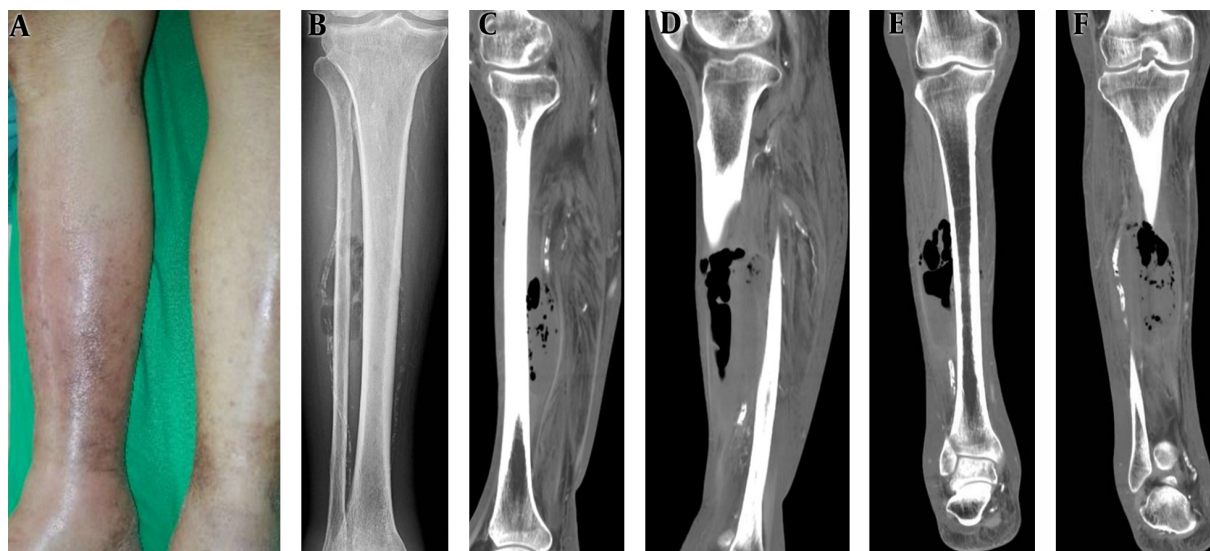


Figure 1. Necrotizing fasciitis of gross picture, plain X ray and computed tomography

Table 1. Patient's Characteristics

Characteristics	Data
Age	76 Years old
Body weight, height, and BMI	70 kg, 170 cm, 24.2 kg/m ²
Underlying diseases	Coronary artery disease for 5 years; Type 2 diabetes mellitus for 30 years; End-stage renal disease undergoing regular hemodialysis for ten years
Systolic and diastolic blood pressure	135/70 mmHg
White blood cell	25000/ μ L
Neutrophil	95%
CRP	11.9 mg/dL
Microbiological analysis	<i>Klebsiella pneumoniae</i>
Calcium, phosphate, and intact PTH	6.5 mg/dL, 6.1 mg/dL, 600 ug/L

Soon, debridement was performed on the same day. Perioperatively, a much purulent discharge was found. The culture yielded KP that was resistant to ampicillin-sulbactam. Flomoxef was applied with a wet wound dressing for three weeks. Moreover, there was no liver abscess and endophthalmitis. A split-thickness graft was applied later, and he recovered fully after one month. The present report was approved by the patient himself and he signed the informed consent.

3. Discussion

NF caused by KP is very rare and rarer still in uremic patients. In addition, most cases occurred in Asia (1), especially in Taiwan (2). However, in recent years such reports

are more frequent, probably in association with the highly virulent capsular serotype K1 of KP. The most common NF cases caused by KP are over lower extremities (2), which is compatible with the current case report. In addition to the endemic area of KP infection, the studied patient had many risk factors as follows: a weak immune system pre-disposed the patient to a rare infection (3). Also, uremic patients usually take iron supplement due to iron deficiency anemia, but iron is essential for bacterial growth and replication (4). The current case took an iron supplement (100 mg per day), which is also a risk factor for KP infection. The patient with uremia underwent regular hemodialysis, which caused hypoperfusion (5). Fluctuating hemodynamic change during hemodialysis might contribute to systemic hypoperfusion and further compromise visceral circulation. The situation facilitated the proliferation of gas-forming organisms and bacterial translocation in his thighs (6). Moreover, he had calciphylaxis (Figure 1B). The calcific uremic arteriolopathy made him more susceptible to infection. Finally, DM is a substantial risk factor for almost all infections (7), particularly for KP infection (8).

Initially, the outcome of NF caused by KP in the current study patient should be very poor according to the study by Liu et al. (9): anemia (8.9 g/dL), more than 24 hours delay from the onset of symptoms to surgery and age above 60 years. The clues to his NF were only high CRP and unexplained pain even after 3-day antibiotic therapy. He even had no leukocytosis, fever, culture report, crepitus, or bulgous lesion. In NF, it relies on very insidious clinical manifestations such as unexplained pain and advanced image studies should be arranged until the exclusion of diagno-

Table 2. Clinical Profiles and Outcomes of Necrotizing Fasciitis Caused by *Klebsiella pneumoniae*

Cases	Age/Gender	Underlying Disease	Presentation	Culture	Superimposed Infection	Treatment	Outcome
Case 1 (10)	50/M	Cirrhosis, child C, edema, vascular disease		Soft tissue	Hepatic abscess	Unknown	Cured
Case 2 (10)	55/F	Cirrhosis, child C, edema, vascular disease	Bullous lesions, extensive cutaneous necrosis	Soft tissue, blood	None	Unknown	Expired
Case 3 (10)	57/F	Cirrhosis, child C, edema, vascular disease	Bullous lesions, extensive cutaneous necrosis	Soft tissue, blood	None	Unknown	Cured
Case 4 (11)	Unknown	Liver abscess	Unknown	Unknown	Unknown	Unknown	Unknown
Case 5 (12)	47/M	Diabetes mellitus	Fever, chills, abdominal pain, leg pain/warm/red/bogginess	Blood, hepatic abscess, soft tissue	Hepatic abscess	Cefazolin, ciprofloxacin, ceftriaxone; Extensive lateral fasciotomy and drainage	Cured
Case 6 (13)	71/M	None	Fever, chills, abdominal pain, painful swelling and erythema with induration	Hepatic abscess, soft tissue	Hepatic, renal, and pancreatic abscess, endogenous endophthalmitis	Ceftriaxone, drainage and fasciotomy	Cured
Case 7 (13)	40/M	Diabetes mellitus	Fever, chills, painful swelling, severe tenderness	Blood and soft tissue	Hepatic abscess,	Cefazolin and gentamicin, fasciotomy	Cured
Case 8 (14)	52/M	HBV-cirrhosis, Child C; diabetes mellitus	Shock, leg pain, purpura, erythema, swelling, and skin necrosis	Blood, and soft tissue culture	Spontaneous bacterial peritonitis	cefoperazone/sulbactam*14 days for SBP with bacteremia, then extensive debridement + amoxicillin/clavulanate and ofloxacin *15 days	Expired
Case 9 (14)	71/F	None	Shock, fever, fluctuant mass, skin necrosis	Blood, urine surgical specimen	None	Extensive debridement, vasopressors, steroid, hemodialysis, antibiotics	Expired
Case 10 (this case)	76/M	Diabetes mellitus, hemodialysis	Leg pain, swelling	Soft tissue only	None	Ampicillin-sulbactam, flomoxef, debridement	Cured

sis. It was good luck that he still had relatively localized NF and CT study was arranged, and debridement followed immediately after the finding of plain film. Until the diagnosis was made, he still had no other comorbidities. All NF cases caused by KP are summarized in Table 2. Of all ten cases, the current study patient was the eldest (76 y/o) and the only one undergoing hemodialysis. The mortality rate was up to 33.3%, with comorbidities, including cirrhosis (cases 2 and 8) and other infections (bacteremia in cases 2, 8, and 9; and peritonitis in case 8). Therefore, in addition to timely diagnosis and treatment, the area of KP infection should also be considered. Even with delayed diagnosis up to 3 days, the patient's life could be saved.

In this patient, early detection of necrotizing fasciitis via simple examination (X-ray) was associated with good outcome. Necrotizing fasciitis caused by *Klebsiella pneumoniae* is rare in patients undergoing hemodialysis. However, despite of its rarity, the diagnosis was timely and accurate.

3.1. Conclusion

NF caused by KP is rarer and even rarer in uremic patients. The manifestation may be insidious and only by being alert to the diagnosis, the patients' lives can be saved. The range of involvement with KP infection is also an important factor for patients' outcomes.

Footnotes

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