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Multi-Sites Infection Caused by *Klebsiella pneumoniae* After Hemopoietic Stem Cell Transplantation

Lin Huang,[1] Yan Yan Hu,[1] and Rong Zhang[1,*]

[1]Department of Clinical Microbiology, The Second Affiliated Hospital of Zhejiang University School of Medicine, Hangzhou, China

[*]*Corresponding author*: Rong Zhang, 88 Jiefang Rd, Hangzhou, China. Tel/Fax: +86- 57187783646, E-mail: brigitte_zx@yeah.net

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Abstract

Introduction: Leukemia patients can easily become hypoimmunity after hemopoietic stem cell transplantation, endogenous infection often happens in these patients. Meanwhile, *Klebsiella pneumoniae* is often isolated from various specimens in inpatient. It can lead to infections in the whole body, especially in those immunosuppressed patients.

Case Presentation: A 22-year-old girl with complete remission after chemotherapy for her acute lymphoblastic leukemia was presented to the 2nd affiliated hospital of Zhejiang University for hemopoietic stem cell transplantation. She got a good check-up, however, her spirit was a little bad. Her primitive lymphocyte (0.06%) and total lymphocyte (27.05%) in the peripheral blood were in the normal range. She received a 224 mL stem cell transfusion including mononuclear cell (4.87×10^8/kg) CD34+ (0.6%) as well as reached the transplantation threshold of CD34+ cell (3×10^6/kg). Nine days after transplantation, there were no severe side effects except a little bit of vomit. However, the symptom of diarrhea appeared first. *K. pneumoniae* was isolated from the stool, then invaded into the blood, and caused sepsis. It disseminated and caused multi-sites infection.

Conclusions: It should be kept in mind that *K. pneumoniae* can translocate across the intestinal epithelium. It is important to pay attention to the bacterium isolated from the intestine in immunosuppressed patients.

Keywords: Multi-Sites Infection, Immunosuppressed Patient, Intestine, *Klebsiella Pneumoniae*

1. Introduction

Klebsiella pneumoniae is one of the most common pathogens (1, 2) and is often isolated from various specimens in the inpatient (3), especially in those immunosuppressed patients, such as cancer patients (4). However, the report of *K. pneumoniae* in the intestine invading into the blood is rare. Here we report a case of multi-site infections caused by *K. pneumoniae* after hemopoietic stem cell transplantation, which was first isolated from the stool, then the blood, the sanies, the throat swab, and the urine.

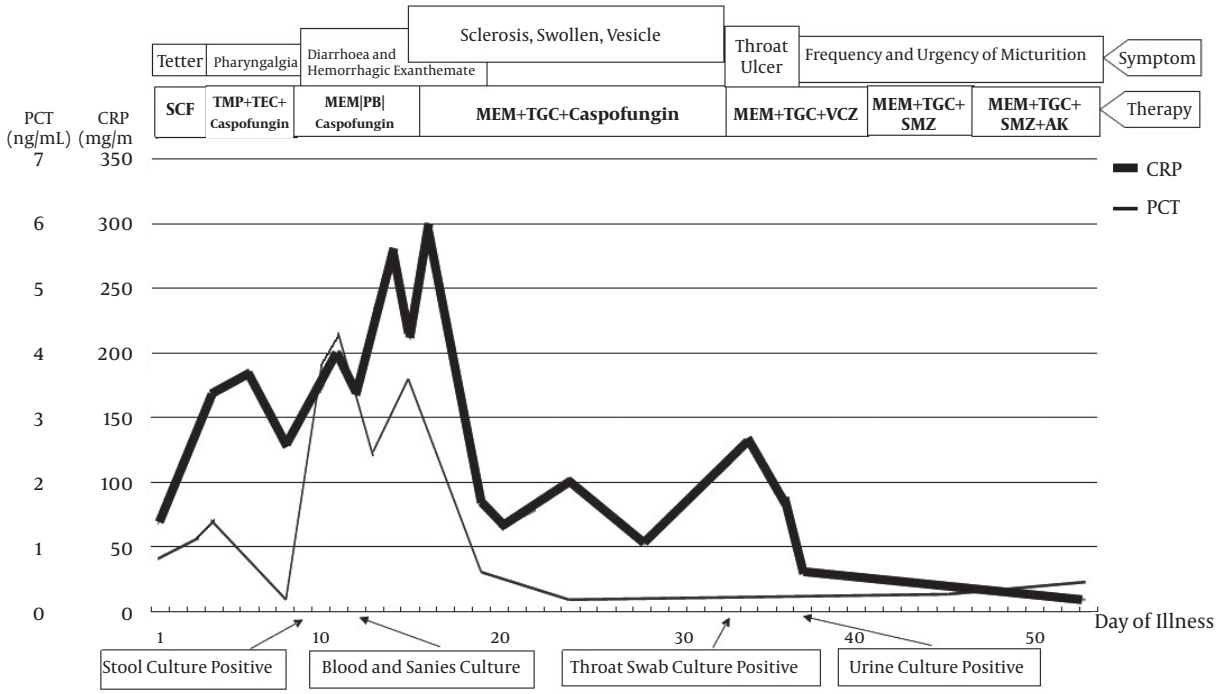
2. Case Presentation

A 22-year-old girl with complete remission after chemotherapy for her acute lymphoblastic leukemia was referred to our hospital for hemopoietic stem cell transplantation on March 22, 2016. On the presentation, her temperature was 36.8°C, blood pressure was 125/93 mmHg and her heart rate as well as respiration were 93/min and 19/min, respectively. She received a good check-up, although, she wasn't in good spirit. Her primitive lymphocyte (0.06%) and total lymphocyte (27.05%) in the peripheral blood were in the normal range. Sulfamethoxazole was used to clean her intestine. BuCy and Flu were used to pretreat the bone marrow before receiving hemopoietic stem cell transplantation on April 5, 2016. Ciclosporin and mycophenolate mofetil were used for preventing a reject reaction.

She received a 224 mL stem cell transfusion, including a mononuclear cell (4.87×10^8/kg), CD34+ (0.6%), as well as reached the transplantation threshold of CD34+ cell (3×10^6/kg). Nine days after transplantation, there were no severe side effects except a little bit of vomit. However, diarrhea and hemorrhagic exanthemate of both knees appeared April 15, 2016 and a 3 cm × 2 cm sclerosis appeared on the right greater lip of pudendum. The right greater and lesser lip of pudendum were swollen 1 day later on April 16, 2016. The inspection results, clinical symptoms, and prescriptions were collected (Figure 1). The isolates were collected from the stool culture on April 15, 2016, the blood culture as well as sanies culture on April 18, 2016, the throat swab culture on May 9, 2016, and the urine culture on May 13, 2016 were all the same bacterium (*K. pneumoniae*).

The antibiotics susceptibility against 5 *K. pneumoniae* strains were the same (Table 1). The *K. pneumoniae* was resistant to all antibiotics that we tested except polymyxin B and tigecycline, as it was called carbapenem-resistant *K. pneumonia*. In addition we detected the resistant genes of carbapenem by PCR (5) and DNA sequence. They were

Figure 1. Clinical Course of the Patient After Hospitalization



Abbreviations: AK, Amikacin; IMP, Imipenem; MEM, Meropenem; PB, Polymyxin B; SCF, Cefoperazone/Sulbactam; SMZ, Sulfamethoxazole; TEC, Teicoplanin; TGC, Tigecycline; VCZ, Voriconazole.

all positive for the bla_{KPC} gene (Figure 2A) and negative for bla_{SME}, bla_{VIM}, bla_{IMP}, bla_{NDM}, bla_{GIM}, bla_{SPM}, bla_{SIM}, and bla_{OXA} genes (data not shown). The resistant gene was bla_{KPC-2} by sequencing. Pulsed field gel electrophoresis (PFGE) (6) demonstrated that the 5 *K. pneumoniae* isolates belonged to the same clone (Figure 2B).

3. Discussion

As we all know, *K. pneumoniae* is one of the most common and clinically important pathogens worldwide, causing abscess (especially liver abscess) (7, 8), and then invades into blood causing multi-sites infection. It can also cause an endogenous infection in diabetes mellitus patients (9-11) as well as cancer patients (12). However, the report of *K. pneumoniae* in the intestine invading into blood is rare. This is the first time to report a *K. pneumoniae* isolate invading into the blood from the intestine in a patient who was receiving hemopoietic stem cell transplantation and then causes multi-sites infection. As we know, due to immunosuppress, leukemia patients often received an opportunistic infection through a different pathway. Like the EB virus and *Aspergillus* infection through respiratory tract (13, 14), urinary tract infection caused by *Escherichia coli* (15) and derma infection is caused by Herpes Zoster (16). However, infection caused by intestinal microbiology is rare, just a report of intestinal dysbacteriosis (17). As Chun-Ru Hsu et al. (18) reported *K. pneumoniae* can translocate across the intestinal epithelium; the gut is always the epicentre of antibiotics resistance (19). Therefore, we need to pay attention to the bacteria isolated from the intestine in the immunosuppressed patients.

Footnotes

Authors' Contribution: Lin Huang collected the data, contributed to the design, and draft of the work. Yan Yan Hu and Rong Zhang contributed to the drafting of the work and critically revising the work for important intellectual content.

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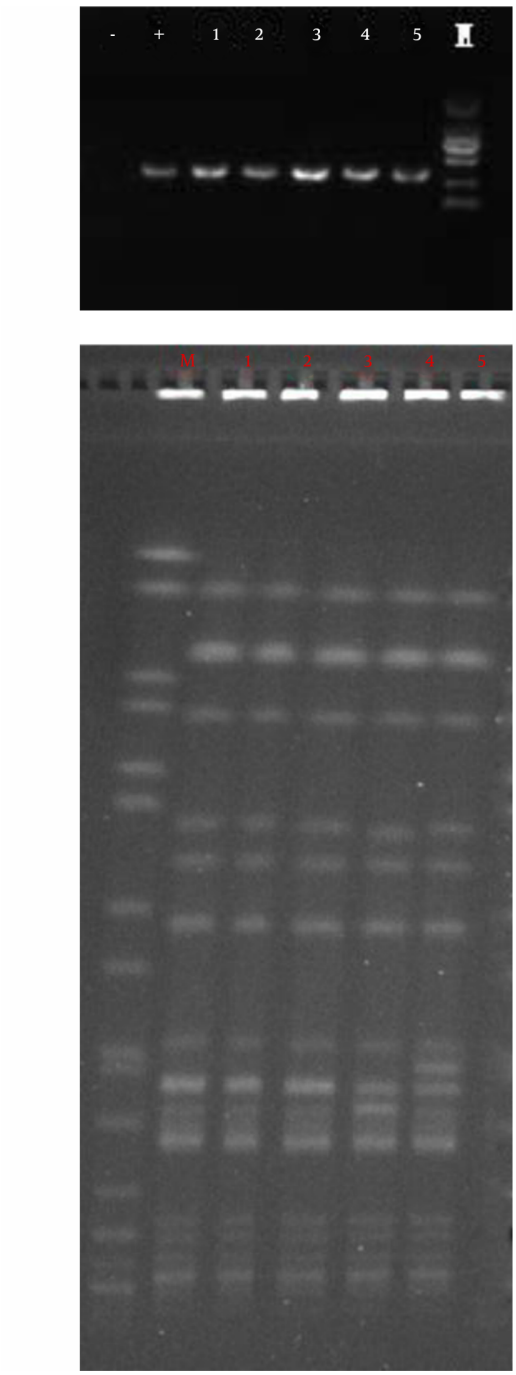

Figure 2. A, PCR of bla_{KPC} Gene of Five *K. pneumoniae* Isolates. Lane -: Negative Control, Lane +: Positive Control, Lane M: Marker DL 2000; B, PFGE of Five *K. pneumoniae* Isolates. Lane M: *Salmonella* Serotype *Braenderup* H9812. Lane 1 ~ 5: *K. pneumoniae* Isolated from Stool, Blood, Sanies, Throat Swab, and Urine

Table 1. Minimum Inhibitory Concentration of Antibiotics

Antibiotics	MIC, μg/mL
Ampicillin	$\geq$ 32
Cefazolin	$\geq$ 64
Gentamicin	$\geq$ 16
Tobramycin	$\geq$ 16
Cefepime	$\geq$ 64
Ceftriaxone	$\geq$ 64
Cefoxitin	$\geq$ 64
Imipenem	$\geq$ 16
Ertapenem	$\geq$ 8
Amikacin	$\geq$ 64
Ciprofloxacin	$\geq$ 4
Levofloxacin	$\geq$ 8
Trimethoprim/sulfamethoxazole	$\geq$ 16/304
Amoxicillin/clavulanate	$\geq$ 32/16
Piperacillin/tazobactam	$\geq$ 128/4
Tigecycline	2
Aztreonam	$\geq$ 64
Polymyxin B	0.5

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