Renal Abscess with *Morganella morganii* Complicating Leukemoid Reaction

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Abstract

We report a case of leukemoid reaction (LR) complicating renal abscess caused by *Morganella morganii* infection in an 80-year-old man. On administration, laboratory tests revealed white blood cell count of 76160/ μ L and C reactive protein 3.09 mg/dL. Although chronic myeloid leukemia was suspected, bcr/abl fusion transcript was not observed. Contrast enhanced computer tomography imaging of the abdomen showed abscess in the right kidney. *M. morganii* was detected repeatedly in material of liquid from the abscess and arterial blood culture. To our knowledge, this is the first case of *M. morganii* infection complicating LR.

Key words: bacteremia, renal abscess, *Morganella morganii*, leukemoid reaction

(DOI: 10.2169/internalmedicine.47.0343)

Introduction

A leukemoid reaction (LR) is a hematological abnormality, defined by persistent neutrophilia of 25,000 to 30,000 cells/ μ L or greater, and induced by reactive causes outside the bone marrow (1). The major causes of LRs are severe infections, intoxications, malignancies, severe hemorrhage, or acute hemolysis (2). A variety of infections, such as *Clostridium difficile* colitis (3), disseminated tuberculosis (4), and severe shigellosis (5) have been associated with the LR. To date, however, there is no report of the LR induced by *Morganella morganii* infection.

Case Report

An 80-year-old man was transferred to the emergency department from a regional hospital because of a high fever and significantly increased white blood cells. One week before admission of the regional hospital, he began to have a high fever with chills, but his history did not suggest any infectious pathology of the biliary, urinary, or respiratory tracts. In past medical history, he had undergone a radical cystourethrectomy with ileal conduit due to bladder cancer eight years previously. A nephrostomy catheter had been inserted in his right kidney and exchanged monthly. He had

been occasionally affected by urinary tract infection and had undergone administration of oral cephalosporins or fluoroquinolones.

On the day of admission, he appeared ill and his vital signs included a high fever (41.2°C), heart rate 108 beats/minute, blood pressure 96/66 mmHg and respiratory rate 22 breaths/minute. Physical examination revealed diffuse, bilateral rhonchi. There was neither heart murmur, peripheral edema, digital clubbing, nor lymphadenopathy. Although there was neither tenderness on abdomen nor ascites, he had mild splenomegaly.

Urinalysis showed small amounts of red blood cells, white blood cells and bacteria. Hematological tests revealed significant leucocytosis, mild anemia and thrombopenia (Table 1). Analysis of arterial blood showed that the partial pressure of oxygen was 53 mmHg, the partial pressure of carbon dioxide was 36 mmHg, and the pH was 7.48. An electrocardiogram revealed sinus tachycardia at a rate of 130. A radiograph of the chest (Fig. 1) showed bilateral diffuse infiltration. Microscopical examination of a specimen of sputum showed microbes of normal flora and a few neutrophils.

Myeloproliferative diseases including chronic myeloid leukemia (CML) and chronic neutrophilic leukemia (CNL) were suspected because of marked leucocytosis and splenomegaly. Bone marrow aspiration from the sternum

Table 1. Hematological and Blood Chemical Values on Admission

VARIABLE	VALUE
Red cell count (cells/ μ L)	303×10^4
Hemoglobin (g/dL)	7.9
Hematocrit (%)	25.6
White cell count (cells/ μ L)	76160
Differential count (%)	
Neutrophils	16
Band forms	5
Metamyelocytes	13
Myelocytes	43
Promyelocytes	3
Lymphocytes	7
Monocytes	13
Eosinophils	0
Platelet count (cells/ μ L)	7.8×10^4
Protein, total (g/dL)	5.7
Albumin (g/dL)	2.9
Bilirubin, total (mg/dL)	1.6
Aspartate aminotransferase (U/L)	63
Lactate dehydrogenase (U/L)	1106
Alkaline phosphatase (U/L)	264
Urea nitrogen (mg/dL)	37
Creatinine (mg/dL)	0.84
Sodium (mmol/L)	146
Potassium (mmol/L)	3.7
Chloride (mmol/L)	103
Calcium (mg/dL)	8.0
Phosphorus (mg/dl)	4.1
C reactive protein (mg/dL)	3.09

Figure 1. A: Chest X-ray on admission. B: Chest X-ray after treatment with antibiotics.

showed myeloid hyperplasia without abnormal morphological appearance. Neither excess of blast nor abnormal cells was found. Although cytogenetic study was not undertaken, bcr/abl fusion transcript was not observed by fluorescence in situ hybridization. Therefore, CML was denied as being the possible cause of the marked leucocytosis. The differential diagnosis between LR and CNL is very complicated because both conditions share identical morphological features, including an elevated LAP score and the absence of the bcr/abl translocation (6, 7). In the present case, we diagnosed

the significant leucocytosis as LR rather than CNL because uncontrolled infection emerged (7). At that point, we diagnosed his illness as LR complicating pneumonia and treated him with antibiotics.

His clinical course is shown in Fig. 2. By administration of ampicillin/sulbactam (3 g i.v., 12 hourly) for seven days and methylprednisolone (500 mg/day) for three days, his pneumonia was improved. However, his low grade fever and marked leucocytosis continued. Enhanced abdominal CT suggested an abscess in the corticomedullary junction of the

Figure 2. Clinical course. BT: Body temperature, WBC: white blood cell, CRP: C reactive protein, Plat: Platelet

right kidney (Fig. 3). On the other hand, there was no finding that revealed the recurrence of bladder cancer or other neoplasms. Due to poor his general condition a major operation was not recommended and the patient underwent echo-guided percutaneous drainage of the renal abscess. We started administration of broad-spectrum antibiotic drug (biapenem 0.3 g i.v., 8 hourly) as an empiric therapy (8). Then, *M. morganii* was detected repeatedly in material of liquid from abscess and arterial blood culture. Antimicrobial susceptibility tests showed resistance to amoxicillin, minocycline and fosfomycin (Table 2). Carbapenem and third generation cephalosporins were sensitive to *M. morganii* from both the renal abscess and arterial blood culture. After administration of biapenem, the general condition and laboratory findings were not improved. Therefore, we switched the antibiotics to ceftazidim (1 g i.v., 8 hourly) referring to published results on the treatment of *M. morganii* (9). In spite of high dosage of antibiotics and other supportive treatments, sepsis was progressive and developed into disseminated intravascular coagulation. He died after 2 weeks of percutaneous puncture.

Discussion

LR can follow exposure to drugs, such as corticosteroids, minocycline, recombinant hematopoietic growth factors, or to toxin such as ethylene glycol (2). Since we used high dose of methylprednisolone in this case after marked leucocytosis, it was impossible to relate corticosteroids and LR. After administration of corticosteroids, its effect might only modify leucocytosis in the clinical course. In addition, other drugs which are reported to cause of LR were not administered before the onset of LR.

Other disorders that can cause LR are mesenteric inflammatory pseudotumor, alcoholic steatohepatitis, and retroperi-

Figure 3. Contrast-enhanced computer tomography imaging of the abdomen shows a focal area of decreased attenuation within the right renal parenchyma, with the involved portion appearing swollen. In the involved area, there was also a round, low attenuation structure with rim enhancement. There was small amount of air in the pelvis of right kidney.

toneal hemorrhage (2). In addition, LRs can present simultaneously with the malignancy. Malignancy-associated LRs are commonly observed in a variety of carcinomas, most notably lung and kidney cancer (2). In the present case, those causes of LRs were denied from clinical history and findings.

Renal abscess can arise from both an initial urinary tract infection (UTI) and hematogenous spreading of bacteria from a primary focus of infection outside the kidney (10). Generally, renal abscess due to UTI is often coupled with urinary tract abnormalities including vesicoureteral reflex, nephrolithiasis, urinary tract obstruction (10, 11). In those cases, enteric gram-negative bacteria are the typical infecting organisms (10, 11). In the present case, the patient had ileal conduit and the nephrostomy catheter in the right kidney, and he had occasionally been affected by urinary tract infection.

In addition, there was no primary focus of *M. morganii* infection in this case. Therefore, we presumed that the present case belonged to the high risk group of renal abscess which developed as an ascending infection.

People requiring long-term urinary tract draining commonly experience catheter-associated UTI (CAUTI) and other problems. Previously, numerous trials have evaluated methods to decrease the risk of CAUTI. Some trials showed improvements in management of the catheters can reduce the risk of CAUTI (12). Also, antibiotic drug prophylaxis for CAUTI is valuable in patients with surgical treatments. Although these methods can prevent CAUTI for weeks at most, there is no effective precaution against CAUTI in long-term catheterized patients like the present case (12).

M. morganii is a gram-negative rod commonly found in the environment and in the intestinal tracts of humans as normal flora (13). Although *M. morganii* ranges widely in the environment, it is an uncommon cause of community-acquired infection. It is most often encountered in postop-

Table 2. Resistance Profile of *Morganella morganii* Isolated from Arterial Blood and Renal Abscess

Antibiotics	Material			
	arterial blood		renal abscess	
	MIC	Inter.	MIC	Inter.
Amoxicillin	64≤	R	64≤	R
Piperacillin	≤0.5	S	≤0.5	S
Cefotiam	8	S	8	S
Cefotaxime	≤0.5	S	≤0.5	S
Ceftazidime	≤0.5	S	≤0.5	S
Cefozopran	≤0.5	S	≤0.5	S
Cefoperazone-sulbactam	1	S	1	S
Flomoxef	≤0.5	S	≤0.5	S
Imipenem-cilastatin	1	S	1	S
Amikacin	≤0.5	S	≤0.5	S
Gentamicin	≤0.5	S	≤0.5	S
Minocycline	16	R	16	R
Levofloxacin	≤0.25	S	≤0.25	S
Fosfomycin	64	R	64	R
Sulfamethoxazole -trimethoprim	≤4.75	S	≤4.75	S

Susceptibilities were determined by microdilution reference method. Interpretive criteria are per National Committee for Clinical Laboratory Standards Guideline. MIC, minimal inhibitory concentration (μg/ml); Inter., interpretation; S, sensitive; R, resistant.

erative or other nosocomial situations (14, 15). The most frequent cause of *M. morganii* bacteremia is postoperative wound infection, and most infections occur in patients who have received recent therapy with beta-lactam antibiotics (15). Other important epidemiological risk factors in these studies was the presence of diabetes mellitus or other serious underlying diseases. Several factors were applicable to developed *M. morganii* bacteremia in the present case.

It has been reported that various infections induce the LR (15). The causes of LR in infections, however, are not fully understood. In innate immunity, some components from microbes are recognized in receptors on host cells. For example, lipopolysaccharid (LPS), or endotoxin, from gram-negative bacterial cell wall can stimulate macrophages. In the macrophage responses to LPS, LPS-binding protein, CD 14 and Toll-like receptors mainly mediate (16). Stimulated macrophage will produce various humoral factors including

tumor necrosis factor (TNF), granulocyte colony-stimulating factor (G-CSF), granulocyte-macrophage colony-stimulating factor (GM-CSF), interleukin-1 (IL-1) and so on (17). It has been implicated that these humoral factors can increase leucocytes in the peripheral blood with moving from storage pool and stimulating production in bone marrow. There is LPS in the outer membrane of *M. morganii*, as in other gram negative bacteria (18). Under the condition of uncontrolled *M. morganii* bacteremia, it is likely that an excessive amount of LPS or other components from microbes can stimulate the immune system and increase the neutrophils in peripheral blood.

To our knowledge, this is the first case of renal abscess with *M. morganii* complicating LR. However, similar cases will be encountered more frequently in the future because of the increase of population with high risks in Japan.

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