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Case Report

A case of *Klebsiella pneumoniae* spondylitis and bacteremia potentially due to inflammation around a fecalith☆

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ABSTRACT

We herein report a case of *Klebsiella pneumoniae* (*K. pneumoniae*) spondylitis and bacteremia in a 90-year-old man with diabetes mellitus who had undergone sigmoidectomy and had a fecalith. Two months prior to admission, he had received antimicrobial treatment for 2 weeks for *K. pneumoniae* bacteremia whose entry was unclear and he was readmitted to our hospital owing to fever and stomachache. *K. pneumoniae* was isolated from two sets of blood cultures, and computed tomography and magnetic resonance imaging revealed inflammation and destruction of the 8th and 9th thoracic vertebra. The diagnosis was spondylodiscitis secondary to *K. pneumoniae* bacteremia. Although the entry point for *K. pneumoniae* was unclear, we suggest that inflammation of the mucosa around the fecalith might have caused the *Enterobacteriaceae* bacteremia.

1. Introduction

Klebsiella pneumoniae (*K. pneumoniae*) is the second most common cause of gram-negative bacteremia. *K. pneumoniae* infections most often occur in hospitals [1], and diabetes mellitus is a common underlying disease for community-acquired infections [2,3]. *K. pneumoniae* usually enters the bloodstream via the urinary tract or biliary tract, although the focal source is unclear in 30% of cases. Because it is an enteric bacterium, *K. pneumoniae* is thought to cause bacteremia via intra-abdominal infection in 10% of cases [4], and intra-abdominal origin is significantly higher in community −acquired settings than hospital-acquired ones [2]. Here, we present a case of *K. pneumoniae* spondylitis and bacteremia potentially due to inflammation around a fecalith.

2. Case report

A 90-year-old man with a medical history of well-controlled diabetes mellitus on insulin therapy. He had previously undergone sigmoidectomy due to colon cancer and had a fecalith in the remaining colon. Two months prior to admission, he had received piperacillin/tazobactam for 2 weeks at our hospital for *K. pneumoniae* bacteremia whose entry was unclear. He was readmitted to our hospital complaining of appetite loss for 2 days.

On admission (day 0), he was febrile (body temperature, 39.4 °C) and shivering. On physical examination, he had a stomachache in the area of the fecalith. Laboratory test results were normal other than an elevated white blood cell count (10,110/μL) and C-reactive protein level (0.63 mg/dL). Computed tomography (CT) showed the preexisting fecalith (Fig. 1) and vertebral destruction in the 8th and 9th thoracic vertebrae. Piperacillin/tazobactam (2.25 g every 6 hours) was administered.

On day 2, two sets of blood cultures were positive for *K. pneumoniae*. Magnetic resonance imaging (MRI) showed abnormal signal intensity in the 8th and 9th thoracic vertebrae and the intervertebral discs between them (Fig. 2). Signal intensity in the vertebral bodies was low on T1-weighted images and high on short-TI inversion recovery-weighted images. Signaling intensity in the intervertebral discs was high on T2-weighted images. The patient was therefore diagnosed with spondylodiscitis secondary to *K. pneumoniae* bacteremia.

On day 3, the treatment was switched from piperacillin/tazobactam to ceftriaxone (2 g every 24 hours) because a microbial

Abbreviations: CT, computed tomography; *K. pneumoniae*, *Klebsiella pneumoniae*; MRI, magnetic resonance imaging; RR, relative risk.

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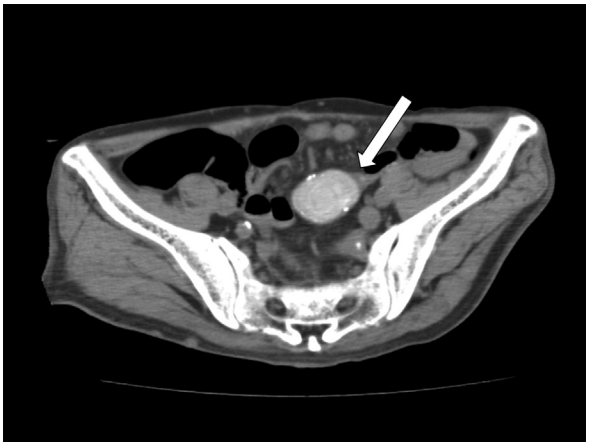

Fig. 1. Computed tomography image showing a preexisting fecalith in the remaining colon (white arrow).

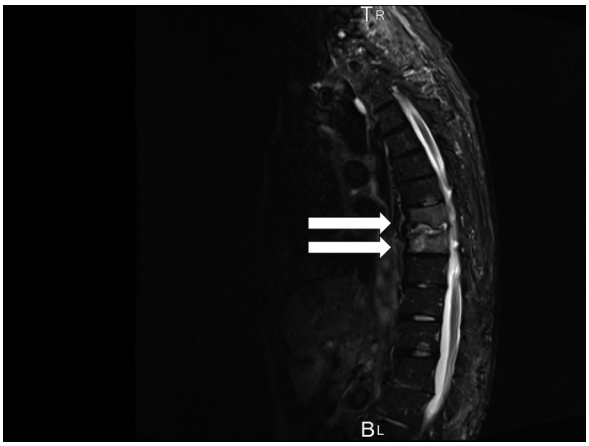

Fig. 2. Magnetic resonance image showing abnormal intensity in 8th and 9th thoracic vertebrae (high signal intensity on a short-TI inversion recovery-weighted image) (white arrow).

sensitivity test showed good sensitivity to ceftriaxone. A string test for this strain was negative. Ultrasonography, urinalysis, urine culture, and CT of the abdomen were performed to determine the entry point for *K. pneumoniae*. None of the findings suggested a urinary tract infection, pneumonia, cholecystitis, or cholangitis.

After initiating antibiotic treatment, the patient's body temperature normalized; however, his fever recurred on day 9. The similar locations of the stomachache and fecalith suggested that the area surrounding the fecalith might be inflamed and hence that *K. pneumoniae* might have entered the bloodstream via the colon. The treatment was switched to cefmetazole (2 g every 12 hours) to prevent potential translocation of other anaerobic bacteria, and the patient recovered completely. Repeated blood cultures on day 9 were negative and moxifloxacin (0.4 g every day) replaced cefmetazole on day 26, and the patient was transferred to a rehabilitation hospital on day 64. Endoscopic or surgical fecalith resection was not indicated owing to his age and general condition. Therefore, moxifloxacin was continued as a chronic suppression treatment.

3. Discussion

This case has two important clinical findings. First, it suggests that the inflammation around a fecalith may cause bacteremia. Second, it shows spondylitis as a complication of *K. pneumoniae* bacteremia, which is rare.

In this case, the entry point of *K. pneumoniae* was unclear. A previous study showed that the focal source of *Klebsiella* bacteremia was the genitourinary tract in 25% of cases, the biliary tract in 19% of cases, and unclear in 30% of cases [4]. However, our patient did not have any signs of a genitourinary tract or biliary tract infection. Because his stomachache was in the same location as the fecalith, bacterial translocation across the intestinal mucosa encompassing the fecalith may have accounted for the bacteremia. To the best of our knowledge, no previous studies have reported the occurrence of fecalith-related bacteremia involving *K. pneumoniae* or other *Enterobacteriaceae*.

Complications of fecal impaction include perforations, ulcers, and intestinal obstructions [5]. In a study in rats, intestinal obstructions increased the risk of bacteremia due to bacterial translocation by four-fold [6]. Deitch et al. reported that *Klebsiella* species were the second most common organisms (21%) in cases involving intestinal obstruction and bacterial translocation [7]. Intestinal obstructions cause obstructive colitis, which is an ulcero-inflammatory lesion in the colon proximal to the obstruction [8]. Mechanisms whereby obstructions might cause bacteremia include increased lumenal pressure and decreased colonic blood flow proximal to the lesion [9,10] and microbial substitution of the intestinal flora [11]. Either of these mechanisms might explain the bacteremia in our case.

The major complications of *K. pneumoniae* infections are urinary tract infections, pneumonia, empyema, and liver abscesses. Additional complications in patients with diabetes mellitus are endophthalmitis and meningitis. Spondylitis as a rare complication of *K. pneumoniae* bacteremia, with only a few reported cases [12–16]. The backgrounds in these cases vary, making identification of the predisposing factors for *K. pneumoniae* spondylitis difficult. On the other hand, there are several known risk factors for *K. pneumoniae* bacteremia including dialysis [relative risk (RR), 57.8], chronic liver diseases (RR, 54.2), organ transplantation (RR, 43.3), cancer (RR, 28.1), and diabetes mellitius (RR, 8.3) [4]. Comparing the underlying conditions in community-acquired settings and nosocomial settings by the onset situation of *K. pneumoniae* bacteremia, diabetes mellitus (20.4% vs. 4.3%, $p < 0.001$) was the only factor that was significantly higher in community-acquired settings, while hematological malignancy (4.7% vs. 28%, $p < 0.001$), prior antibiotic use (7.3% vs. 48.9%, $p < 0.001$), central line catheter (2.6% vs. 32.8%, $p < 0.001$), urinary catheter (3.7% vs. 17.7%, $p < 0.001$) were significantly higher in hospital settings [3]. In our case, diabetes mellitus was the only identified risk factor for *K. pneumoniae* bacteremia.

In addition, we did not check pathogenetic genes in this case. Recent studies suggested the existence of hypervirulent *Klebsiella* strains with negative string test. K1, K2 capsular serotypes, rmpA, rmpA2, aerobactin and yersiniabactin are the common responsible factors of hypervirulent phenotypes [17]. Therefore, this case might have been affected by those strains due to the invasive infections.

As a study limitation, we were unable to provide pathological evidence of obstructive colitis because surgery was not indicated. We also could not identify the causative organism in the vertebral bodies of the affected vertebrae. However, Nolla et al. reported that blood cultures are positive in 72% of vertebral osteomyelitis cases [18]. Diagnosis of a vertebral infection often relies on a typical clinical presentation, compatible imaging findings, and isolation of the causative organism from a blood culture or vertebral body biopsy sample [18]. In our case, the diagnosis of spondylitis was reasonable because *K. pneumoniae* was isolated from a blood culture and both CT and MRI showed findings typical of spondylitis.

In summary, we presented a case of *K. pneumoniae* spondylitis and bacteremia whose portal entry point was unclear. This case suggests that the fecalith in the colon might cause bacteremia. Further research is needed to test this hypothesis.

Conflicts of interest

None.

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