INTERNAL MEDICINE

□ CASE REPORT □

Spontaneous Pyogenic Spondylitis Caused by *Klebsiella pneumoniae*

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Abstract

A 72-year-old woman without a history of spinal injury was admitted to our hospital with prolonged severe back pain and high fever. Clinical laboratory findings and magnetic resonance imaging (MRI) revealed severe inflammation of the L2 and L3 lumbar vertebrae. Meropenem trihydrate administration improved her symptoms. *Klebsiella pneumoniae* isolated from the patient's blood indicated that the organism caused the spontaneous pyogenic spondylitis.

Key words: spondylitis, *Klebsiella pneumoniae*, blood culture, MRI, antibiotics

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Introduction

Spontaneous pyogenic spondylitis is one of the most severe infectious diseases of the neurological system, and most cases in adults are related to previous spinal surgical procedures (1-3). *Staphylococcus aureus* and *Staphylococcus epidermidis* are frequently the causative pathogens in postoperative patients, whereas pyogenic spondylitis due to *Klebsiella pneumoniae,* which is a common pathogen of pneumonia among diabetic patients, is very rare. Here, we describe spontaneous pyogenic spondylitis caused by *Klebsiella pneumoniae*.

Case Report

A 72-year-old woman was admitted to our hospital with low back pain and fever accompanied by chills that had persisted for one month. She had type-2 diabetes mellitus (DM) that was treated with a mixture of 30% regular insulin and 70% neutral protamine hagedorn insulin (daily injections of 14 and 10 units before breakfast and dinner, respectively). She had no history of vertebral surgery or injuries. A physical examination upon admission showed a body temperature of 38.0℃, tenderness over the lower lumbar spine, and body flexion limited by pain. The results of a motor examination and deep tendon reflexes were normal, although an eye examination revealed diabetic reticulopathy.

Laboratory findings showed severe inflammation (C-reactive protein, 28.9 mg/dl; white blood cells, 2.9×10^4/μl). Hyperglycemia (plasma glucose, 505 mg/dl) and elevated HbA_{1c} (10.5%) indicated uncontrolled DM. Renal dysfunction because of diabetic nephropathy and iron deficiency anemia were also identified (Table 1). Arterial blood gas findings suggested hypocapnea, but the pH value was within the normal range. Chest and abdomen radiography and computed tomography (CT) showed no abnormalities, and transthoracic echocardiography did not reveal any findings suggestive of endocarditis. Lumbar spine X-rays showed only signs of degenerative changes. However, magnetic resonance imaging (MRI) revealed spondylitis lesions involving the L2-L3 vertebrae without a paravertebral mass or epidural involvement, and narrowing of the disc space at L 2-3 without discitis (Fig. 1). *Klebsiella pneumoniae* was iso-

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Table 1. Laboratory Findings

Blood cell count		Blood chemistry		Serology examination	
White blood cells	2.9×10^4 / μl	Total protein	6.4 g/dl	Fe	9.0 μg/dl
Red blood cells	380×10^4 / μl	Total bilirubin	0.5 mg/dl	Ferritine	165.6ng/ml
Hemoglobin	10.8 g/dl	AST	12 IU/l	IgG	1330mg/dl
Hematocrit	32.5 %	ALT	14 IU/l	IgA	384mg/dl
Platelet	34.7×10^4 / μl	ALP	301 IU/l	IgM	100mg/dl
		LDH	199 IU/l		
Urinalysis		BUN	28.1 mg/dl	Blood gas analysis	
Protein	(2+)	Creatinine	1.2 mg/dl	pH	7.437
Glucose	(4+)	Na	128 mEq/l	PaO2	85.7 mmHg
Ketone	(2+)	K	4.1 mEq/l	PaCO	22.8 mmHg
Occult blood	(2+)	Cl	91 mEq/l	HCO3-	15.6 mmol/l
Red blood cells	<1 /HPF	Total Cholesterol	147 mg/dl	Base Excess	-6.5 mmol/l
White blood cells	5-9 /HPF	HDL-Cholesterol	28 mg/dl		
		Triglyceride	146 mg/dl		
Urine C-peptide (24h)	19.2 μg/day	C-reactive protein	28.9 mg/dl		
		Glucose	505 mg/dl		
		HbA1c	10.5%		

ALT: Aspartate aminotransferase, ALT: Alanine aminotransferase, ALP: Alkaline phosphatase, LDH: Lactate dehydrogenase, BUN: Blood urea nitrogen

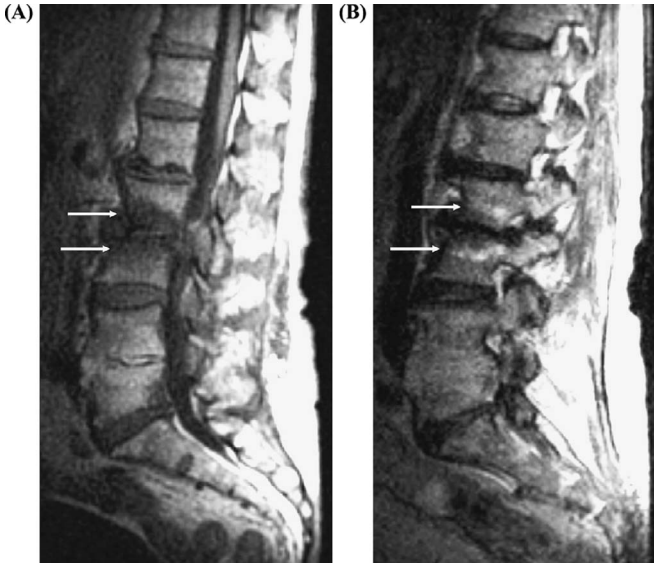

Figure 1. MRI image shows abnormal intensity of L2-L3 vertebrae (arrows) and narrowed disc space at L2-3. (A), T1- and (B), T2-weighted images.

lated from two blood cultures. We suspected pyogenic vertebral osteomyelitis caused by *Klebsiella pneumoniae* based on these findings and the patient was administered with meropenem (1.5 g/day) intravenously for 4 weeks because the isolated *Klebsiella pneumoniae* was of the Extended-Spectrum β-Lactamase-producing strain, followed by the oral administration of levofloxacin (400 mg/day). The isolated organism was sensitive to these antibiotics, and drainage was not required because the lesion did not form abscesses. Laboratory findings such as C reactive protein, 2.6 mg/dl and white blood cells, 3.5×10^3/μl, were also significantly improved, and we finally diagnosed spontaneous pyogenic spondylitis caused by *Klebsiella pneumoniae*.

We controlled the DM by changing the insulin administration to three injections of regular insulin (4 units each) and one of ultralente insulin (4 units before bedtime) per day. The patient was discharged from our hospital on day 29 and followed up at another local hospital.

Discussion

The incidence of pyogenic spondylitis has increased due to an increase in the numbers of the elderly with underlying diseases, such as spinal impediments or who have undergone surgery, and the prevalence of intravenous drug abuse, even though, the latter is not prevalent among the elderly in Japan (1-3). Immunocompromised status, including congenital types and that secondary to corticosteroid use, DM, malnutrition, and neoplasms are also risk factors for developing pyogenic spondylitis.

However, 30% of patients with pyogenic spondylitis have no history of infection or surgery, which suggests that the condition is spontaneous and caused by hematogenous spread in this population (1, 3). In addition, vertebral infection represents only 2-4% of all instances of osteomyelitis, and the suggested annual incidence of septic discitis is 2/100,000/year (4, 5).

Pyogenic spondylitis should be considered among the differential diagnoses of patients aged >50 years with low back pain because delayed diagnosis and treatment are associated with a worsened outcome (6). However, early diagnosis is very difficult because symptoms usually appear during the late state of the disease.

Magnetic resonance imaging (MRI) is ideal for evaluating vertebral infections (7, 8) and its sensitivity and specificity

are 96 and 93% when vertebral osteomyelitis is present (9, 10). A lesion encompassing two adjacent vertebral bodies and the intervertebral disk space is the classic presentation of vertebral osteomyelitis. The low signal intensity on T1-weighted images of the present patient indicated edematous changes in the bone marrow and in the intervening intervertebral disk space, with high signal intensity of the two adjacent vertebral bodies on T2-weighted images.

We could not identify the causative organism from the lesion, but blood cultures contained *Klebsiella pneumoniae*. Blood cultures are positive in about one-third of patients with spinal infection, indicating that infective organisms cause vertebral osteomyelitis is these patients (1, 11). When blood cultures are positive, antibiotics can be administered, and invasive biopsies can be avoided.

Klebsiella pneumoniae, which is a facultative rod, is the frequent cause of lobular pneumonia in patients with DM (12, 13). Extra-pulmonary *Klebsiella* infections are far less common, and those of the bone and/or neurological system are quite rare (12, 14). Only a few patients with spontaneous spondylitis caused by *Klebsiella pneumoniae* have been described in the literature (15-18).

Klebsiella pneumoniae usually causes illness among patients with risk factors such as DM, or among those who have undergone spinal surgery. However, spontaneous spondylitis caused by *Klebsiella pneumoniae* can develop in the absence of a medical history (15). A cervical spinal epidural abscess also caused by *Klebsiella pneumoniae* has been improved by prompt drainage (18). Thus, *Klebsiella pneumoniae* should be considered an important causative pathogen in spontaneous pyogenic spondylitis

The pathogenetic mechanisms of spontaneous pyogenic spondylitis caused by *Klebsiella pneumoniae* have been unclear, but DM is one of the most frequent etiological complications of *Klebsiella pneumoniae* infection (19), and phagocytosis of *Klebsiella pneumoniae* is impaired in patients with type 2 DM and poor glycemic control (20). Furthermore, DM is the most common underlying condition among patients with pyogenic vertebral osteomyelitis (21-23).

Dysfunctional neutrophils due to DM might have led to the translocation of *Klebsiella pneumoniae*, which then infected spondylitis lesions involving the L2-L3 vertebrae in our patient.

Klebsiella pneumoniae is also implicated as a triggering and/or perpetuating factor in the etiopathogenesis of ankylosing spondylitis, and high levels of anti-*Klebsiella pneumoniae* antibodies could be a useful marker of early AS (24). We did not measure anti-*Klebsiella pneumoniae* antibodies in this patient, but immunological reactions might be related to the onset of spondylitis.

In conclusion, we described a patient who developed rare spontaneous pyogenic spondylitis due to *Klebsiella pneumoniae*. Spontaneous pyogenic spondylitis should be considered as a differential diagnosis for elderly patients with lower back pain, especially among those with DM. Early diagnosis and appropriate therapy will result in better outcomes.

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