Klebsiella pneumoniae brain abscesses in an elderly patient without clinically evident neurological signs and symptoms

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Abtract

Purpose: It is difficult to diagnose a brain abscess if the patient does not have clinically evident neurological features. We present the diagnosis and therapeutic course of an elderly woman with multiple Klebsiella (K.) pneumoniae brain abscesses without neurological signs or symptoms.

Case report: The patient was an 81-year-old woman without diabetes who had been discharged from our hospital about 7 days before this admission with a diagnosis of K. pneumoniae urinary tract and bloodstream infections. She did not have any clinically evident neurological features except for a fever, however focal suppurations were identified in the cerebral hemispheres and lungs by magnetic resonance imaging (MRI) and computed tomography, respectively. After an 11-week course of antibiotic treatment and serial cranial MRI follow-up studies, she was discharged in a stable condition with no neurological sequelae.

Conclusion: Cranial MRI should be performed to identify the presence of brain abscesses in elderly patients with K. pneumoniae bloodstream infections but without clinically evident neurological signs or symptoms. Serial MRI studies are important to monitor the therapeutic course.

Key words: *Klebsiella pneumoniae*, brain abscess, elderly, non-diabetic

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INTRODUCTION

A brain abscess is a serious focal infection of brain parenchyma, in which the most common neurological features are headache and focal neurological signs[1-4]. A brain abscess can cause serious morbidity or death if it is not detected and treated as early as possible due to brain herniation and acute ventriculitis by rupturing into ventricles[1-3]. The absence of classic presentations in patients with a brain abscess may result in a delayed diagnosis and poor therapeutic outcomes. Therefore, an early diagnosis and treatment are important issues when treating this specific group of patients. In this study, we report the case of an 81-year-old woman without

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diabetes with *Klebsiella (K.) pneumoniae* brain abscesses without clinically evident neurological signs, and also demonstrate changes in serial cranial magnetic resonance imaging (MRI) features of the brain abscesses during the therapeutic course.

CASE REPORT

The patient was an 81-year-old woman with a past history of hypertension, small intestine obstruction *s/p* operation, gallbladder stones and cholecystitis. On 2017/02/01, she was sent to our Emergency Department (ED) due to chills and fever for 1 day. On examination she looked acutely ill, but her consciousness was clear. She did not have a headache, and her vital signs were as follows: body temperature 38.1°C, pulse rate 84/min, and respiratory rate 18/min. A physical examination revealed clear breath sounds, regular heart beat and soft abdomen on palpitation. A neurological examination revealed a supple neck with no other meningeal irritation signs. Her cranial nerves were intact and there was no evidence of papilledema. Her muscle power and deep tendon reflexes of the four limbs were unremarkable. An initial blood test at the ED (2017/02/01) revealed: peripheral white blood cell (WBC) count 9600/uL (normal: 3500-11000 mg/L), hemoglobin 12.3 g/dL (normal: 12-16 g/dL), C-reactive protein 21.7 mg/L (normal: <5 mg/L), alanine aminotransferase: 8 U/L (normal: 0-40 U/L), blood urine nitrogen 16.0 mg/dL (normal: 6-21 mg/dL), creatine 0.8 mg/dL (normal: 0.44-1.03 mg/dL), postprandial blood glucose 116 mg/dL (normal < 120 mg/dL), and glycated hemoglobin (HbA1c) 5.9% (normal 4.6-5.6%). Urine analysis revealed a WBC count of 45/uL (normal: <15) and was positive for bacteria, and a chest X-ray revealed consolidation over bilateral lower lung fields.

Based on the clinical presentation, laboratory data and recent medical history before this ED visit (an 8-day hospitalization (2017/01/17- 2017/01/25) for *K. pneumoniae* urinary tract and bloodstream infections), she was given intravenous (*i.v.*) ceftriaxone (1 g Q12h) therapy on 2017/02/01. Because of the possibility of metastatic abscesses, she also received a brain computed tomography (CT) examination on 2017/02/01, and the results showed mild attenuation in the left high frontal

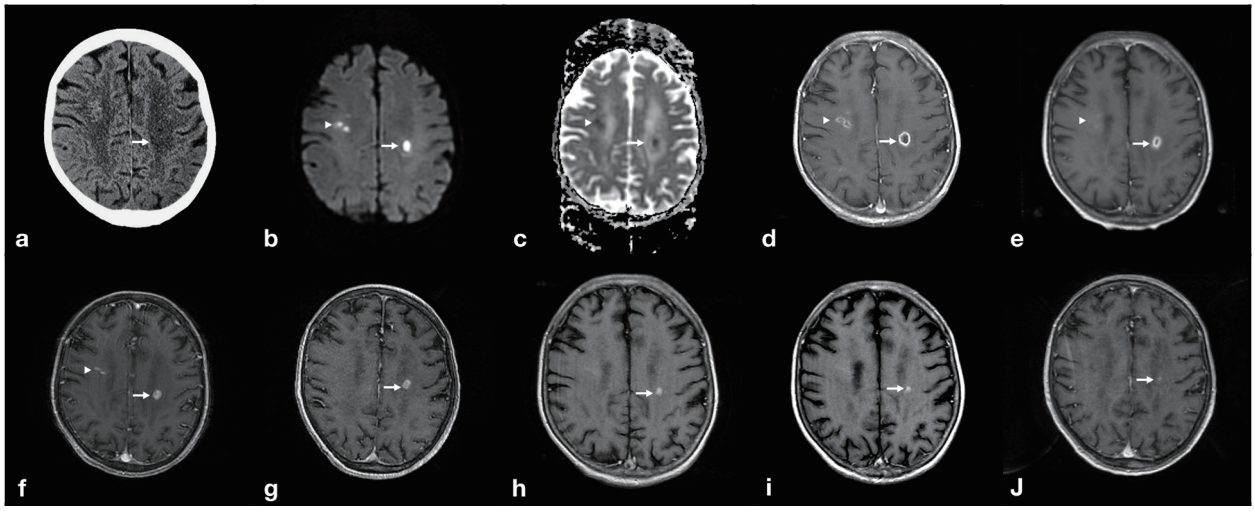

Figure 1. 1a: Brain computed tomography. 1b: Magnetic resonance imaging diffusion-weighted images (DWI) and corresponding apparent diffusion coefficient (ADC) maps (1c) as well as T1-weighted Gd-contrast enhancement (1d-1J). Figure 1a, at the time of admission, showing a hypointense lesion (white arrow) in the left frontal lobe. Figures 1b, 1c and 1d, captured at the time of admission, showing bilateral frontal lobe cystic lesions with ring enhancement. Figures 1e-1i, captured at the 2nd, 4th, 6th, 8th, and 10th weeks, respectively, showing a gradual regression of the brain abscesses. Figure 1j, captured at 22 months after treatment, showing a mild residual enhanced lesion.

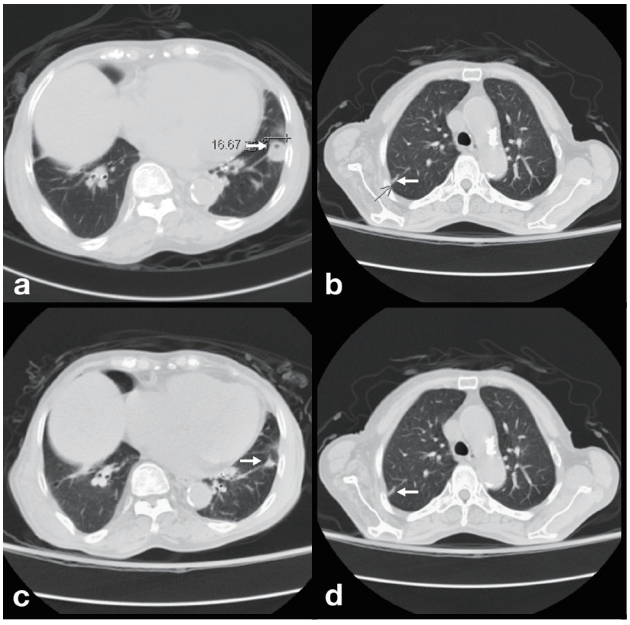

Figure 2. Chest computed tomography with contrast enhancement. Figures 2a and 2b, captured at the time of admission, showing pulmonary abscess formation in the left lower and right upper lungs. Figures 2c and 2d, captured at 1 month after the treatment, showing regression of the abscesses.

lobe (Figure 1a). A subsequent brain MRI study on 2017/02/06 revealed multiple brain abscesses over the bilateral corona radiata (Figures 1b and 1c). Because of these neuroimaging findings, the (*i.v.*) ceftriaxone regimen was adjusted to 2 g Q12h. To confirm the diagnosis and to monitor the therapeutic effect, serial brain MRI studies were performed, and the results showed progressive regression of the brain abscesses (Figure 1). To monitor changes in the pulmonary abscesses, a series of chest CT studies were also performed, and the results also showed progressive regression of the pulmonary abscesses (Figure 2). Renal echography performed on 2017/2/08, and hepatic MRI performed on 2017/2/10 did not reveal any evidence of focal suppuration. After an 11-week therapeutic course (2016/2/08-2016/4/26), she was discharged in a stable condition with no neurological deficits. A follow-up cranial MRI study (22 months after the treatment) revealed a marked regression of the brain abscesses. The latest outpatient clinical follow-up evaluation on 2018/05/9 revealed stable physical and neurological conditions.

DISCUSSION

The clinical presentations and neuroimaging features of brain abscesses are protean[4-6], and they vary greatly depending on the distribution and number of brain abscesses, preceding medical and/or surgical conditions, and the time period of the study[5-9]. Variations in clinical presentations have also been reported in other epidemiologic trends of central nervous system (CNS) infections including bacterial meningitis[10,11]. In elderly patients, the classic presentations are known to be more obscured, causing difficulties in making a diagnosis[10,11]. Elderly patients are also known to be more vulnerable to infectious diseases including CNS infections[12,13], and also to have poor therapeutic outcomes. Our 81-year-old female patient did not have the classic neurological presentations of a brain abscess, however, because she had a recent history of *K. pneumoniae* bloodstream infection we arranged a series of surveys to detect possible metastatic focal suppuration of highly susceptible organs, which confirmed the presence of multiple metastatic focal suppurations. The formation of multiple metastatic abscesses is known to be an invasive characteristic of the pathogen *K. pneumoniae*[14,15], and focal suppurations were found in both the brain and lungs in our patient.

In Taiwan, *K. pneumoniae* is one of the leading pathogens involved in adult CNS infections[10,16]. The development of multiple metastatic abscesses is also known to be a serious complication of *K. pneumoniae* bloodstream infections[14], and the development of a brain abscess is a known manifestation of the invasive syndrome of *K. pneumoniae* infection[14]. Many virulence factors including the presence of capsular serotype K1/K2, mucoviscosity-associated gene A, rmpA and aerobactin have been associated with the development of the invasive syndrome of *K. pneumoniae* infection[17]]. In Taiwan, high incidence rates of virulence factors such as the mucoid phenotype of pathogenic *K. pneumoniae* strains have been reported[17]. Although the invasive syndrome of *K. pneumoniae* infection is usually seen in patients with predisposing factors such as diabetes mellitus and liver cirrhosis, it has also been reported in patients without diabetes[18]. However, except for old age, our patient did not have any of these factors. Therefore, we suggest that thorough surveys of occult focal suppurations in both

diabetic and non-diabetic patients with *K. pneumoniae* bloodstream infections should be performed in Taiwan. With antibiotic treatment and serial neuroimaging follow-up studies, the *K. pneumoniae* brain abscesses in our patient resolved.

In conclusion, in clinical practice, it is not feasible to detect the virulence factors of the implicated *K. pneumoniae* strains before arranging surveys and treatment. To avoid missing occult metastatic abscesses, and especially brain abscesses, in patients with *K. pneumoniae* bloodstream infections in Taiwan, thorough and extensive imaging surveys are needed in patients with or without risk factors, especially diabetes mellitus. In patients with occult brain abscesses, serial neuroimaging follow-up studies should be used to monitor the therapeutic effect and decide the therapeutic course.

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