

# Occult community acquired *Klebsiella pneumoniae* purulent meningitis in an adult

## A case report

Kai-Chuang Yang, MD<sup>a</sup>, Tejashwi Shrestha, MD<sup>b</sup>, Manish Kolakshyapati, MD<sup>c</sup>, Ling-Fei Shi, MD<sup>d</sup>, Zheng Wang, MD<sup>e</sup>, Min Li, MD<sup>e</sup>, Lin Lou, MD<sup>a</sup>, Jia Zhou, MD, PhD<sup>e,\*</sup>

### Abstract

**Rationale:** *Klebsiella pneumoniae* (*K. pneumoniae*), primarily a hospital-acquired pathogen, can cause a variety of deep-seated infections with significant morbidities. However, in the current scenario of global rise in antibiotic abuse, unexpected infection could be caused by *K. pneumoniae*.

**Patient concerns:** A 56-year-old male who presented with intermittent headache and low fever was admitted, he had transsphenoidal surgery for pituitary adenoma 3 years ago. Routine laboratory tests revealed an elevated WBC count of  $10.12 \times 10^9/L$  and C-reactive protein (CRP) 12.9 mg/L. computed tomography (CT) revealed the sellar region with suspicious hemorrhage.

**Diagnoses:** The patient was initially diagnosed with acute residual tumor hemorrhage. But the consequent diagnose of *Klebsiella pneumoniae* purulent meningitis was made based on the cerebrospinal fluid lab test and cerebrospinal fluid (CSF) and blood culture, and CT scan.

**Interventions:** Lumbar puncture examination was made and the antibiotics were adjusted to meropenem and vancomycin according to the antibiotic sensitivity test. But because of the patient's unstable vital signs, his family refuse further lateral ventricular drainage.

**Outcomes:** The infection was out of control and the patient died of spontaneous breath and heartbeat arrest.

**Lessons:** Through this case, we could learn that any clue of suspicious intracranial infection should be carefully considered in the current scenario of global rise in antibiotic abuse. The manifestation of intermittent headache and mild fever could be potential signs of fatal infection, and prompt appropriate measures should be taken timely.

**Abbreviations:** CRP = C-reactive protein, CSF = cerebrospinal fluid, CT = computed tomography, DM = diabetes mellitus, ECG = electrocardiograph, GCS = Glasgow coma scale, *K. pneumoniae* = *Klebsiella pneumoniae*, MR = magnetic resonance, WBC = white blood cell.

**Keywords:** *Klebsiella pneumoniae*, occult infection, purulent meningitis, septic shock

## 1. Introduction

*Klebsiella pneumoniae* (*K pneumoniae*) was first identified by Friedlander in 1882 and considered to be responsible for a severe

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<sup>a</sup> Department of Neurosurgery, Zhejiang Provincial People's Hospital & People's Hospital of Hangzhou Medical College, Hangzhou, Zhejiang, China, <sup>b</sup> Department of Clinical Neuroscience and Therapeutics, <sup>c</sup> Department of Neurosurgery, Graduate School of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan, <sup>d</sup> Department of Geriatrics, <sup>e</sup> Department of Neurosurgery & Gamma Knife Center, Zhejiang Provincial People's Hospital & People's Hospital of Hangzhou Medical College, Hangzhou, Zhejiang, China.

\* Correspondence: Jia Zhou, Zhejiang Provincial People's Hospital, Hangzhou, Zhejiang, China (e-mail: cneagles@sina.com).

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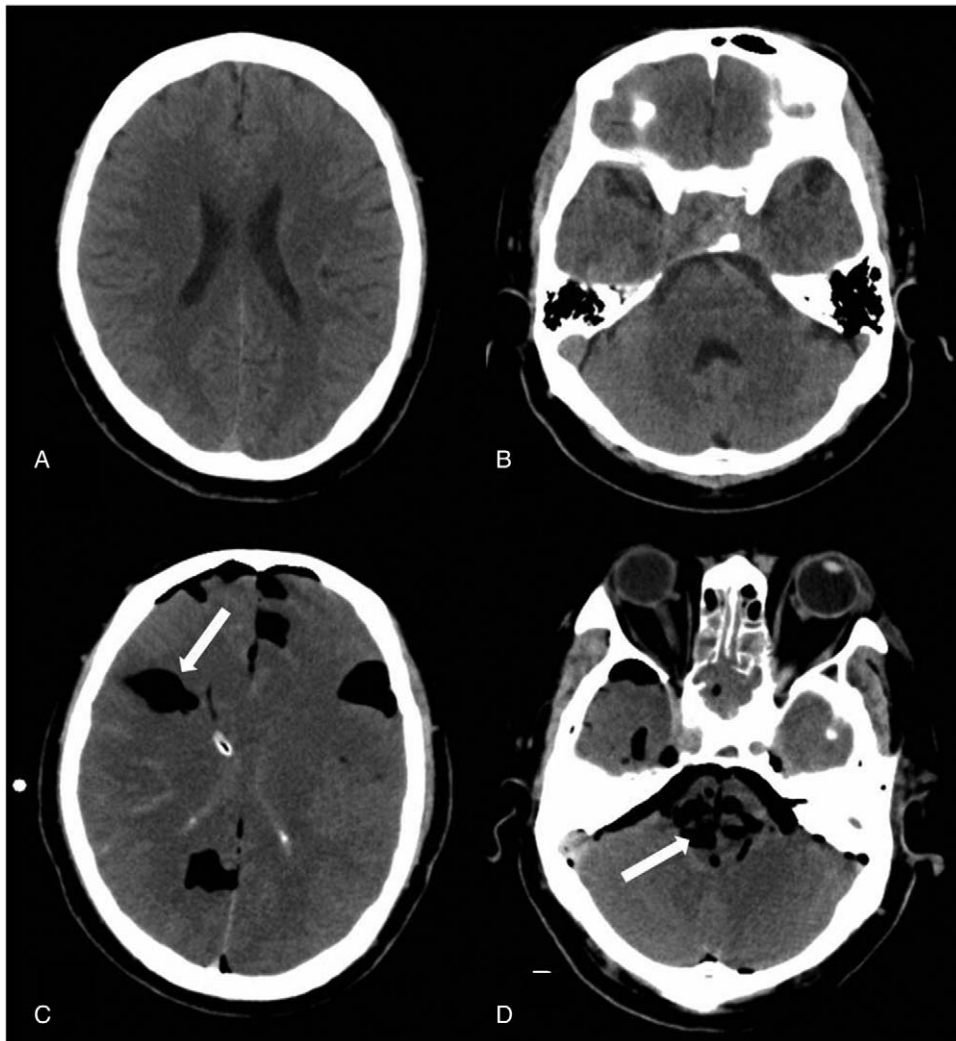
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form of lobar pneumonia.<sup>[1]</sup> *K pneumoniae* infections are usually hospital-acquired and occur primarily in patients with impaired host defenses;<sup>[2]</sup> however, reports have also indicated it as a rare cause of community-acquired mono-microbial pyogenic liver abscess that could cause central nervous system metastatic lesions.<sup>[3–5]</sup> Here, we present and discuss a case of 56-year-old male pyogenic meningitis patient who was diagnosed as spontaneous community-acquired *K pneumoniae* pyogenic meningitis 3 years after the transsphenoidal pituitary adenoma resection.

## 2. Case report

A 56-year-old male resident of Hangzhou in Zhejiang Province of China presented with a chief complaint of intermittent headache and fever for 3 days. He had a past surgical history of transsphenoidal surgery with subtotal tumor resection for pituitary adenoma done 3 years ago, followed by gamma knife stereo-radiosurgery done twice, 3 years and 1 year ago. He had no history of cerebrospinal fluid (CSF) leakage, chronic illness, alcohol or drug abuse or recent travel, tick bites, or contact with sick.

On physical examination, the patient's body temperature was 38.2°C, heart rate 85 bpm, blood pressure 125/78 mm Hg, respiratory rate 18 breaths/min. He had a doubtful neck resistance. The right pupil was slightly larger and asthenocoria



**Figure 1.** CT scan when the patient fell into coma, showed the ventricle system (A and B) was almost normal, the structure of the brain was clear. CT scan at the 3rd day, showed that there was pneumocrania (C), the ventricle system was squeezed, the CSF signal was high in density, the brain was swelling, the structures of around the brainstem were obscure (D). CT=computed tomography.

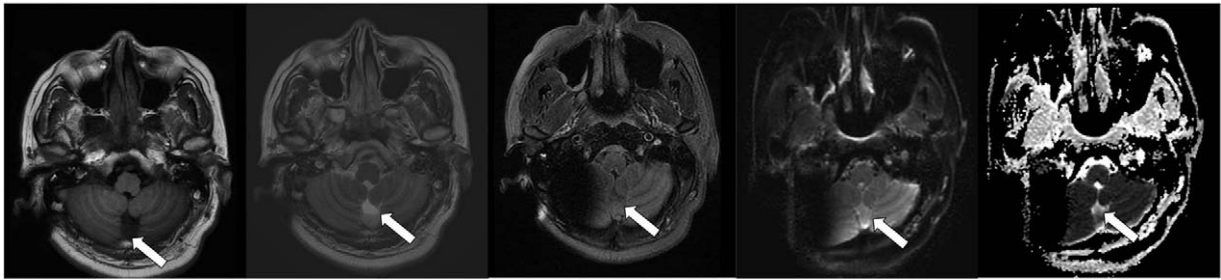
resulting from oculomotor nerve injury during previous surgery. Other physical examinations were within normal limits. Laboratory test indicated a white blood cell (WBC) count of  $10.12 \times 10^9/L$  with a normal neutrophil ratio of 59.9%. The concentrations of C-reactive protein (CRP) and blood glucose were 12.9 mg/L and 6.63 mmol/L, respectively. Coagulation test demonstrated an increased D-dimer of 860  $\mu\text{g/L}$ . Serum pituitary hormone test (cortisol, sex hormone, thyroid hormone, and growth hormone) results were normal. The ECG studies, chest CT scan, and abdominal ultrasonography were normal. Because of the history of pituitary adenoma resection, computed tomography (CT) scan was performed and demonstrated residual tumor (25mm  $\times$  24mm) in the sellar region with only suspicious hemorrhage.

A working diagnosis of acute residual tumor hemorrhage was made and the patient was treated with dehydration and hemostasis therapy.

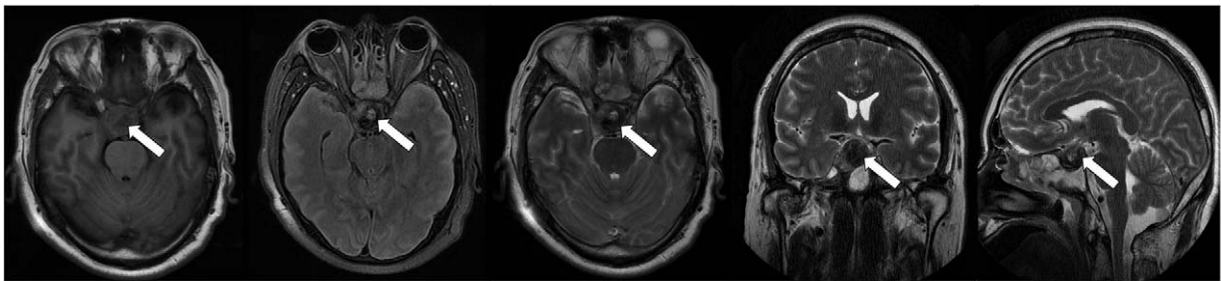
In the next 3 hours, the patient experienced progressive headache followed by sudden lose in the left eye vision and loss of consciousness as well as arrest of spontaneous heartbeat and breath within a few minutes. Cardiopulmonary resuscitation (CPR) was made, only recovered the spontaneous heartbeat of patient. Then, immediate head CT scan and magnetic resonance

(MR) and MR venography (MRV) was taken. It showed no obvious difference in CT scan compared to the initial one (Fig. 1A and B). Head MR and MRV showed no obvious signs of cerebral infarction or venous sinus thrombosis (Fig. 2), only at the cisterna magna the CSF signal was inhomogeneous (Fig. 3). Due to the loss of spontaneous breathing, unstable hemodynamic (D-dimer rose over 30,000  $\mu\text{g/L}$ ) and blood pressure (cannot be detected), the patient need mechanical ventilation and intensive care, it was too dangerous to take further invasive examination. So the patient was transferred to the ICU, had endotracheal intubation and mechanical ventilation.

On the second day, the patient had no improvement, pupils were equally dilated with the diameter of 4mm and no light reflex, GCS score was 1 + 1 + 1. The highest body temperature was 37.6°C, and the blood pressure and hemodynamic were still unstable. Lumbar puncture was performed which showed the intracranial pressure of 400 mm H<sub>2</sub>O and the CSF was yellow, thick. CSF was collected for routine examination, biochemistry and for Gram staining and bacterial culture. CSF cytology showed had 2520 white blood cells/ $\mu\text{L}$  with 90% as neutrophils, 34000 red blood cells/ $\mu\text{L}$ , protein 2570 mg/L, glucose 0.03 mmol/L, and chloride ion 112.7 mmol/L. Lateral ventricular drainage



**Figure 2.** MR scan showed the remnant pituitary adenoma in the sellar region, some part of the tumor had equal or low signal in T1 and T2 (white arrow), suggesting the susceptible tumor hemorrhage 2 or 3 days ago. MR = magnetic resonance.



**Figure 3.** The CSF signal was inhomogeneous at the cisterna magna. It seems that there was an fluid-fluid level at the cisterna magna (white arrow), in axial image of T1 and T2, FLAIR, DWI, and ADC-map. CSF = cerebrospinal fluid.

was done. The above findings confirmed purulent meningitis and septic shock. Daptomycin and linezolid in combination with voriconazole were given as intravenous empirical antibiotic treatment.

Aerobic and anaerobic cultures of peripheral blood as well as CSF culture and the antibiotic sensitivity test revealed the Gram negative *K pneumoniae* as the pathogen. Another repeat CT scan of head on the 3rd day showed no obvious signal changes in the sellar region, while, the signal at the posterior fossa had dramatic difference (Fig. 1C and D). It can then be inferred that *K pneumoniae* caused the purulent meningitis and septic shock in the patient, so the antibiotics were adjusted to meropenem and vancomycin. Lateral ventricular drainage or bilateral ventricular irrigation was suggested, but his family refused further invasive treatment. Finally, the vital signs and homeostasis of the patient deteriorated rapidly. Eventually the patient was died of cardiac arrest.

### 3. Discussion

In adult patients' intracranial infection, the most common pathogens were *Neisseria meningitidis*, *Streptococcus pneumoniae*.<sup>[6]</sup> *K pneumoniae* caused pyogenic meningitis were rare, and mostly found in patients with history of head trauma or surgery,<sup>[7]</sup> or as the septic metastatic lesions of invasive *K pneumoniae* liver abscess syndrome, at 13% of incidence.<sup>[4]</sup>

*K pneumoniae* is Gram-negative, nonmotile, capsulated, gas-producing bacterium widely found in nature. In humans, it constitutes the normal flora of oral cavity and intestine.<sup>[8]</sup> *K pneumoniae* could be a community acquired pathogen that can cause bacterial meningitis with significant morbidities if diagnosis is delayed.<sup>[9]</sup> What happened in this patient neither fit the

definition of hospital-acquired infection,<sup>[10]</sup> nor did he had signs of recent infection or immune system impairment. It can only be inferred that we encountered a rare case of occult community acquired *K pneumoniae* pyogenic meningitis.

Early recognition of meningitis is not always easy, particularly when the patient presents with no-specific symptoms. The focus can be obscure in patients presenting with light febrile disorder alone and no other major complaints.<sup>[11]</sup> However, considering the global background of antibiotics abuse,<sup>[12]</sup> *K pneumoniae*—an opportunistic pathogenic bacteria—can give rise to severe occult intracranial infection in an unexpected way.<sup>[13]</sup> The CSF culture result may explain the rapid progression of disease course and unfortunate result of this patient. The poor prognostic factors including old age, the presence of coma or shock, CSF sugar below 10mg/dL or protein above 750mg/dL and the presence of gram negative organisms in the CSF.<sup>[14]</sup>

The globally risen in antibiotic resistance and opportunistic infections demand careful but decisive judgment in using broad-spectrum antibiotics prior to identification of causative pathogen. Antibiotics should be adjusted as guided by the antibiotic sensitivity test immediately after the culpable pathogen has been identified. Acute stage CT scans performed within the first 4 weeks of illness revealed ventriculomegaly in 33% bacterial meningitis,<sup>[15]</sup> this supporting their role in suspected cases.

DM patients with poor or uncontrolled glycaemia had higher frequency of original or metastatic infections.<sup>[16]</sup> It is generally accepted that an increased blood-glucose level can inhibit phagocyte chemotaxis, phagocytosis and bactericidal activity, and contributes to bacterial growth and a compromised host defense system.<sup>[17]</sup> The patient in this case had blood-glucose slightly higher than normal level, this may also be a reason why the infection progress so fast.

This patient reported here was a healthy middle-aged man with no known underlying risk factors such as DM history or immunodeficiency. The residual pituitary adenoma misled the clinicians in making the initial diagnosis; however, following lumbar puncture the final diagnosis was made. The antibiotics adjustment according to antibiotic sensitivity test seems of little help to the patient. It may relate to pus accumulation in the ventricular system which causes severe inflammatory reaction. So, in addition to using intravenous antibiotics, lateral ventricular drainage or bilateral ventricular irrigation/ drainage was equally important for reducing the number of bacterial colonies, alleviating the ventricular system from pus, relieving inflammatory reaction of the brain tissue.

#### 4. Conclusion

Patients who presented in emergency with mere intermittent headache and mild fever should be given enough attention; intracranial infection should be considered and identified in the first priority. Once the diagnosis is confirmed, combination of early lateral ventricular drainage and prompt appropriate antibiotic administration is the suggested treatment strategy for tackling this emergency. Antibiotics should be adjusted according to the culture and antibiotic sensitivity of bodily fluid (blood, CSF, sputum, etc.).

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#### Author contributions

**Conceptualization:** Jia Zhou, Min Li, Lin Lou.

**Data curation:** Kai-Chuang Yang, Jia Zhou, Ling-Fei Shi, Zheng Wang.

**Formal analysis:** Jia Zhou, Zheng Wang.

**Resources:** Jia Zhou.

**Supervision:** Jia Zhou, Zheng Wang.

**Validation:** Jia Zhou, Tejashwi Shrestha.

**Writing – original draft:** Kai-Chuang Yang, Jia Zhou.

**Writing – review & editing:** Jia Zhou, Tejashwi Shrestha, Manish Kolakshyapati, Min Li, Lin Lou.

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