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A rare case of klebsiella pneumoniae meningitis associated with hepatic abscess

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Abstract

Background: *Klebsiella pneumoniae* meningitis is a rare but life-threatening infection, often associated with liver abscesses or bacteremia.

Case presentation: We report a 44-year-old man with poorly controlled diabetes presenting with seizures and altered sensorium, found to have *K. pneumoniae* meningitis and a hepatic abscess, with negative blood cultures.

Conclusion: This case underscores the need to consider *K. pneumoniae* as a cause of meningitis even in the absence of bacteremia, particularly in diabetic patients, and highlights the importance of early recognition and targeted therapy.

Introduction

Metabolic encephalopathy can result from a variety of causes. Bacterial meningitis is commonly secondary to infections of *streptococcus pneumoniae* (58%) [1], *streptococcous agalactiae* (GBS; 18.1%), neisseria meningitidis (13.9%), and *haemophilus* influenzae (6.7%). However, in U.S cases of meningococcal disease have increased since 2021, with 438 confirmed or probable cases in 2023 [2]. The increase in neisseria meningitidis (stereotype Y), has been a main cause in the increase in cases seen. Here, we present a rare case of metabolic encephalopathy secondary to *Klebsiella pneumoniae* meningitis with positive urine and liver abscess cultures but negative blood cultures.

Case presentation

A 44-year-old Hispanic male with a history of insulin-dependent type 2 diabetes mellitus, managed with glipizide, presented to the emergency department following a reported seizure and altered mental status. The patient was reportedly in his usual state of health until approximately two days prior to admission, when the patient began experiencing increased fatigue and somnolence. According to the patient's wife, the patient became unresponsive and increasingly lethargic while en route to church, eventually developing generalized tonic-clonic movements involving all extremities. No associated symptoms were reported, including fever, chills, nausea, vomiting, headache, chest pain, palpitations, diaphoresis, abdominal pain, urinary or bowel complaints. There was no witnessed head trauma or evidence of bladder or bowel incontinence.

On arrival, the patient was afebrile (98°F), tachycardic (HR 120), and normotensive (BP 110/70 mmHg). Oxygen saturation was 97% on 2L Oxygen *via* nasal cannula. Initial labs were notable for a serum glucose of 800 mg/dL, sodium 127 mmol/L, chloride 89 mmol/L, bicarbonate 16.6 mmol/L, and an anion gap of 21.4. Creatinine was elevated at 1.6 mg/dL. ABG revealed a pH of 7.395, CO_2 29.9 mmHg, and HCO_3 17.9 mmol/L. Platelet count was 39 K/µL. HbA1c was 11.7%. Urine drug screen was negative. Urinalysis showed marked bacteriuria and glucosuria. Head CT did not show acute infarct or hemorrhage. The patient was admitted to the medical intensive care unit (MICU) for presumed hyperglycemic hyperosmolar state and initiated on an intravenous insulin infusion.

Despite correction of hyperglycemia and volume resuscitation, the patient remained encephalopathic. After MICU admission, the patient experienced a witnessed generalized tonic-clonic seizure and developed a fever of 103°F. Seizures persisted despite benzodiazepines and antiepileptics, necessitating endotracheal intubation. A full septic workup was obtained, and empiric broad-spectrum antimicrobials were started, including vancomycin, ceftriaxone, metronidazole, and ampicillin.

CT abdomen revealed a 20 mm lesion in the right hepatic lobe concerning for abscess. On hospital day three, the patient remained febrile (Tmax 104.2°F) despite antimicrobial therapy. Lumbar puncture

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was performed once platelet count exceeded 40K. CSF opening pressure was 35 cm H_2O; the fluid appeared cloudy and colorless with elevated glucose (121 mg/dL), protein (167 mg/dL), and LDH (517 IU/L). Dexamethasone 10 mg IV every 6 hours was initiated. Later that day, urine culture grew *Klebsiella pneumoniae.* On hospital day five, CSF culture also resulted positive for *Klebsiella pneumoniae*. The hospital course was further notable for drainage of the hepatic abscess, which cultured the same organism.

Results and discussion

Klebsiella pneumoniae is a gram-negative, non-motile, encapsulated, lactose-fermenting, facultative anaerobic, rod-shaped bacterium that can cause devastating disease to the human body [3]. It affects middle aged to older men more than women. Populations particularly susceptible include those with impaired respiratory host defenses, diabetes, alcoholism, malignancy, liver disease, chronic obstructive pulmonary diseases, glucocorticoid therapy, kidney failure, and certain occupational exposures (such as papermill workers) [3].

K. pneumoniae must enter the respiratory tract to cause pneumonia, or the blood to cause a bloodstream infection. In healthcare settings, *K. pneumoniae* bacteria can be spread through person-to-person contact (contaminated hands of healthcare personnel, or other people *via* patient to patient) or, less commonly, by contamination of the environment; the role of transmission directly from the environment to patients is controversial. However, the bacteria are not spread through the air. Patients in healthcare settings also may be exposed to *K. pneumoniae* when they are on ventilators, or have intravenous catheters or wounds.

Now how does a patient get *Klebsiella* meningitis?

Different clinical patterns in regards to the site of infection from *K. Pneumoniae* can be identified globally. In Taiwan for example the source was pneumonia in 29% of cases, liver abscess 18% and urinary tract infections accounted for 15%. In comparison to other countries where the source was urinary in 38% of cases, acute cholangitis 18% and 17% was related to intravascular catheter infections [4-7].

The most common non-iatrogenic infection caused by *Klebsiella* bacteria is pneumonia. These patients have an increased incidence of developing lung abscesses, cavitation, empyema, and pleural adhesions. *Klebsiella pneumonia* has a death rate around 43%, even with antimicrobial therapy [6].

Hypervirulent klebsiella pneumonia (hvKp) is a rather recent *K. pneumoniae* variant that is significantly more virulent than classical *K. pneumoniae* (cKp). While cKp is an opportunistic pathogen responsible for nosocomial infections that usually affect immunocompromised patients. HvKp is clinically more concerning since it also causes disease in healthy individuals and can infect virtually every site of the body. The genetic traits that lead to this pathotype are included in a large virulence plasmid and potentially on additional conjugative elements. One visual trait of these strains is hypermucoviscous phenotype and a string test can be used to help the diagnosis [3,4]. Further examinations and treatments are made on a case-by-case basis, as there are currently no international guidelines.

Conclusion

It is particularly important to consider all causes of metabolic encephalopathy in young adult patients without significant medical history. In this case, the commonplace thought of drug or alcohol use may have led to the misclassification of agitation and altered mental status as withdrawal and subsequent sedation, which may have delayed the diagnosis. Meningitis from *klebsiella* is rare, occurring in 3% of meningitis cases. *Klebsiella* is commonly found in the UTI (14.5%) or gastrointestinal infections (5%-35%), but rarely (insert percentage) in meningitis. Additionally, it is rare to see a case where hematologist spread was not the source of bacterial seeding. We suspect the UTI or liver abscess to be the primary source. The patient's only risk factor was poorly controlled diabetes; with no recent hospital exposure or medical procedures. This case exemplifies how important a wide differential diagnosis can be and a reminder to always consider infection as a source or altered mental status.

Conflicts of interest

The authors declare no conflict of interest.

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