Community acquired *Klebsiella pneumoniae* meningitis: a case report

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Abstract

Introduction *Klebsiella pneumoniae* meningitis is most commonly seen as a nosocomial infection and in post-neurosurgical patients. Reports of community acquired *Klebsiella pneumoniae* meningitis cases are rare in the United States. The objective of this case report is to discuss an uncommon pathogen causing meningitis, *Klebsiella pneumoniae*, its risk and prognostic factors and to emphasize the importance of early recognition and appropriate antibiotic treatment.

Case report We report a clinical case of adult community acquired *Klebsiella pneumoniae* meningitis with recovery. A 54-year-old diabetic male presented with two-week history of intermittent fevers, acute bilateral ear pain, headache and unsteady gait. Broad spectrum antibiotics were initiated. *Klebsiella pneumoniae* was isolated in the cerebrospinal fluid cultures. The patient recovered with only mild hearing loss in his left ear.

Conclusion Our case highlights the importance of suspecting *Klebsiella pneumoniae* in community acquired meningitis.

Keywords Community acquired meningitis, *Klebsiella pneumoniae*, meningitis

Introduction

Acute bacterial meningitis is a medical emergency that requires prompt recognition and prompt treatment with broad-spectrum antibiotics. Meningitis is a syndrome consistent with the classical triad of fever, headache and meningismus, with inflammation in the subarachnoid space.¹ Patients typically present with two of the three symptoms and possibly altered mental status. Prompt recognition and initiation of appropriate antibiotics are the principal steps towards improving patient survival and neurological outcome. Although cerebrospinal fluid testing is the gold standard

for diagnosing meningitis, antibiotics should not be withheld to obtain lumbar puncture. The most common pathogens in the age group over 50 years are *Streptococcus pneumoniae* (57%), *Neisseria meningitidis* (14%), *Listeria monocytogenes* (4%), and aerobic Gram-negative bacilli (3%).^{1,2} Meningitis occurs in 1.38 cases per 100,000 population in the United States and has a mortality of greater than 20% amongst adults, depending on the organism.^{1,3} Gram-negative rods, mostly *Escherichia coli* and *Klebsiella* species represent less than 3% of community acquired

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meningitis cases.¹ *Klebsiella pneumoniae* is a nosocomial infection generally seen in post neurosurgical patients. Community acquired *Klebsiella pneumoniae* meningitis is rare in the United States but reported in Taiwan, Thailand, and Hong Kong.⁴

The objective of our case report is to emphasize the importance of early recognition of community acquired *Klebsiella pneumoniae* meningitis, and appropriate antibiotic treatment in acute bacterial meningitis for successful outcome.

Case report

A 54-year-old diabetic Hispanic male with medical history significant for uncontrolled diabetes mellitus was admitted from the emergency department with a two-week history of intermittent fevers, bilateral ear pain, severe headache and unsteady gait. He was originally from El Salvador, had lived in the United States for the last 5 years and denied any recent travel. On admission, his temperature was 38.8°C (101.8°F), weight 79.2 kg, pulse rate 132/minute, respiratory rate 22/minute and blood pressure 135/91 mmHg. He was ill appearing but conscious, oriented with Glasgow Coma Scale (GCS) of 15 and had no neck stiffness. Otoscopic exam revealed left opaque tympanic membrane with loss of light reflex but no discharge. The otoscopic exam of the right ear was unremarkable. There was no mastoid tenderness. Examination of the sinuses, dentition and throat was unremarkable. Lung exam was clear and cardiac exam revealed tachycardia. No focal neurological deficits were present.

Laboratory tests showed white cell count 22,280/cmm with neutrophilic predominance of 87%, hemoglobin 16 g/dL and platelet count 310,000/cmm; serum glucose 427 mg/dL; serum lactate 4.8 mg/dL; anion gap metabolic acidosis of 19; positive serum and urine ketones; glycated hemoglobin (A1C) of 14.7%. Urinalysis revealed no nitrites or leukocytes. Blood cultures were negative for bacterial and fungal growth. Chest X-ray was unremarkable. A 12-lead electrocardiogram revealed sinus tachycardia.

The patient was admitted to the Medical Intensive Care Unit (MICU) for diabetic ketoacidosis (DKA) with sepsis (renal and liver dysfunction) from otitis media and suspected acute bacterial meningitis. The patient was started empirically on intravenous ceftriaxone 2 grams every twelve hours, vancomycin 1 gram every twelve hours, ampicillin 2 grams every four hours, and dexamethasone 10 milligrams every six hours. Computed tomography (CT) and magnetic resonance imaging (MRI) of the brain revealed right frontal sinus inflammatory change. Lumbar puncture (LP) was performed with immediate post procedure relief of the patient's headache (Figure 1).

Figure 1. Opaque cerebrospinal fluid extracted during initial lumbar puncture from our patient

Cerebrospinal fluid (CSF) analysis showed: opalescent fluid; opening pressure of 38 cmH₂O; WBC of 28,800/cmm with 88% neutrophils, 8% lymphocytes; glucose of 6 mg/dL (serum glucose of 296) and protein of 508 mg/dL. CSF Gram stain revealed no organisms. CSF cultures grew *Klebsiella pneumoniae*, hypervirulent strain by string test (up to 7 mm), sensitive to all antibiotics except for ampicillin, on day 3 of admission. Overtime, the patient improved clinically. Dexamethasone was discontinued. DKA and sepsis resolved. The antibiotics were de-escalated to ceftriaxone immediately following

the CSF culture results. Repeat LP on hospital day 11 showed significant improvement in CSF analysis: clear fluid; opening pressure decreased to 13 cmH₂O; WBC decreased to 137/cmm with 20% neutrophils, 67% lymphocytes; glucose increased to 101 mg/dL (with serum glucose of 243); protein decreased to 226 mg/dL and negative repeat CSF culture. The patient completed an 18-day course of intravenous ceftriaxone. He improved with only mild hearing loss in his left ear and completed a total of 21-day course of antibiotics.

Discussion

Acute bacterial meningitis has high mortality and morbidity despite widespread availability of antimicrobial and adjunctive therapy, due to its atypical presentation and failure to be recognized early.⁵ Clinical outcomes for *Klebsiella pneumoniae* meningitis have been poor as similar cases have led to disseminated intravascular coagulation (DIC) and even recurrent infection.^{6,8}

Community acquired *Klebsiella pneumoniae* meningitis, although rare in the United States, commonly causes rapid deterioration of mental status and high mortality.^{6,7} Case reports from Taiwan, Thailand, and Hong Kong report higher incidence with diabetes, alcoholism and chronic liver disease.⁹ In a study performed in Taiwan, patients with community acquired *Klebsiella pneumoniae* meningitis were more likely to have preceding infections such as pyogenic liver abscess, septic endophthalmitis, pneumonia, otitis media, urinary tract infection, lumbar discitis and perianal abscess,⁸ while hospital acquired *Klebsiella pneumoniae* meningitis cases were more likely to have undergone neurosurgical procedures.⁸

Uncontrolled diabetes may explain the patient's increased risk of developing meningitis with *Klebsiella pneumoniae* instead of the more common species found in the United States such as *Streptococcus pneumoniae*, *Neisseria meningitidis* and *Listeria monocytogenes*. Our patient had no history of recent surgery and no abscesses identified in the contrast-enhanced brain MRI. The primary source of infection remains unknown. A possible source could be the otitis

media or the paranasal sinuses. Although rare, there have been reported cases of otitis media associated with *Klebsiella pneumoniae* meningitis.^{8,10}

Multiple studies have found that the major determinant of survival and favorable neurological outcome is the early timing of the first intravenous antibiotic dose prior to deterioration of mental status (GCS of 7 points or less).^{5,8} The choice and exact duration of antimicrobial therapy have not been universally agreed upon for the treatment of *Klebsiella pneumoniae* meningitis. Extended-spectrum cephalosporins have typically been the drugs of choice; however, aztreonam, carbapenems, aminoglycosides, and ciprofloxacin have all been used with varying efficacy.⁸ The suggested duration of therapy has varied from 14 to 21 days.⁸ Ultimately, the choice of antibiotics and the duration of antibiotic therapy should be tailored to the response of each individual patient.

Repeat LP should be considered in patients whose condition has not responded clinically after 48 hours of appropriate antimicrobial therapy.² If repeat LP is performed, Gram staining and culture results should be negative after 24 hours of appropriate antibiotic therapy.² Overall, the decision to repeat LP should be individualized, such as in cases of suspected relapsing infection or in multidrug resistant organisms.

Conclusion

Acute bacterial meningitis in adults from community acquired *Klebsiella pneumoniae* requires a high degree of clinical suspicion, prompt recognition, and early empiric treatment to prevent morbidity and mortality. Although *Streptococcus pneumoniae*, *Neisseria meningitidis* and *Listeria monocytogenes* remain the most common causes of bacterial meningitis, in the US, clinicians must consider other rare and atypical etiologies.

Consent: Verbal and written consent was obtained from the patient for publication of the case report and any accompanying images

Authors' contributions statement: BL provided medical treatment, wrote the case history, researched the discussion and was involved in the clinical follow-up of the patient. KY, HMM, PS and UJ provided medical treatment, revised the literature and contributed to the discussion. HMM collected medical information. SI supervised the lumbar puncture included in the case report. JV revised the literature. SA and JA supervised the patient treatment plan and revised the literature. All authors read and approved the final manuscript.

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