Klebsiella pneumoniae invasive syndrome in a diabetic patient with gallbladder abscess

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Abstract
The mortality rates for Klebsiella pneumoniae invasive syndrome range from 4% to 11% with diabetes as a major risk factor. Early diagnosis of KPIS can decrease mortality rate with good outcomes due to sensitivity of K pneumoniae to antibiotics in KPIS.

KEYWORDS diabetes mellitus, gallbladder abscess, Klebsiella pneumoniae, liver abscess

1 | INTRODUCTION

With emerging cases of pyogenic liver abscess (PLA) in the Western countries, Klebsiella pneumoniae invasive syndrome (KPIS) should be alerted when patients present atypical vague symptoms including fever, chill, nausea, vomiting, and right upper quadrant tenderness. The disease is often overlooked in the Western physicians due to its rarity.

Klebsiella pneumoniae, a Gram-negative bacillus, is a well-known human nosocomial and community pathogen that usually causes respiratory and urinary tract infections. Klebsiella pneumoniae invasive syndrome (KPIS), however, is a rare clinical condition that often presents with primary liver abscess that causes vague constitutional symptoms including fever, chill, nausea, vomiting, and right upper quadrant tenderness.1 Bacteremic dissemination causes extrahepatic complications including meningitis, brain abscess, endophthalmitis, and necrotizing fasciitis. Infections are mainly reported in South-East Asian areas with major strains of community-acquired hypermucoid K pneumoniae of the capsular K1 and occasionally K2 serotypes.2 These specific hypermucoviscous strains are susceptible to most antibiotics and relatively easy to treat with early identification. However, the mortality rates for KPIS range from 4% to 11%, reflecting the diagnostic delay possibly due to lack of suspicion in Western physicians about this disease.3,4

Diabetes mellitus (DM) is believed to be one of the major risk factors of KPIS with up to 63% of Taiwanese patients with pyogenic liver abscess (PLA) have DM, possibly due to impaired phagocytosis of K1/K2 K pneumoniae in DM patients. However, in European patients, biliary tract diseases including cholelithiasis, cholecystitis, and malignancies were identified in 55% of cases, whereas DM was identified only in about 7% of cases as major risk factors. Consequently, it remains unclear whether diabetes is an independent risk factor for KPIS. Other risk factors include fatty liver disease, prior antibiotic use, and possibly host genetic factors (eg, Chinese ethnicity). Here, we report a rare case of monomicrobial infection of pansensitive K pneumoniae in the gallbladder that perforated the gallbladder wall with subsequent massive liver expansion that initially present with features of metastatic invasion.

2 | CASE REPORT

A 66-year-old woman with a history of hypertension presented with chronic epigastric abdominal pain, subjective
fever, nausea, and vomiting over last several months. Patient is a poor historian and only speaks Haitian Creole. At the time of the presentation, patient was taking 12.5 mg amlodipine. Abdominal ultrasound revealed no intra-, or extrahepatic biliary dilatation with dilated common bile duct measuring 8 mm at the porta hepatis with calcified mass in the gallbladder fossa. CT and MRI abdomen confirmed large cystic and solid components measuring about 10 cm transversely arising in the gallbladder fossa with possible invasion of the gastric antrum with differentials including severe cholecystitis and gallbladder malignancy (Figure 1A,B). Hematology and oncology, surgery, and infectious disease teams were consulted. Laboratory testing showed WBC 12.85 × 10^3/μL, neutrophils 8.69 × 10^3/μL, alkaline phosphatase 127 units/L, AST 45 units/L, ALT 31 units, glucose 431 mg/dL, and HgA1c 14.5%. The patient tested negative for HIV, HBV, and HAV. Tumor markers including CEA, AFB, and CA19-9 were all within normal limits. 72-hour blood cultures showed negative for bacteria and fungus. Surgery was not indicated at the moment due to extension of gallbladder fossa into the duodenum and the stomach. Patient was prescribed with piperacillin-tazobactam 4.5 g for possible infection, hydralazine 10 mg for hypertension, insulin sliding scale for glucose control, ketorolac, and morphine for pain management, and acetaminophen for fever.

Interventional radiology was consulted, and drainage of the cystic lesion produced about 80 mL purulent pus in 24 hours. Culture of the pus grew pansensitive \textit{K pneumoniae} (only resistant to ampicillin) with no anaerobes. On the 5th day of admission, patient was afebrile, normotensive with WBC 6.87 × 10^3/μL, neutrophils 3.44 × 10^3/μL, alkaline phosphatase 91 units/L, AST 26 units/L, ALT 18 units, and glucose 172 mg/dL. Patient was then discharged home with continuous drainage. The patient was prescribed with levofloxacin 500 mg Q 24 hours for 10 days; metronidazole 500 mg, p.o., Q 8 hours for 5 days.

3 | OUTCOMES

Patient was scheduled for follow-up as an outpatient in the internal medicine clinic 5 days after discharge. Patient was afebrile, and abdominal pain has resolved with minimal drainage since discharge. Patient reported no adverse effects from the antibiotics. Follow-up CT scan revealed minimal abscess (Figure 2). Gallstones were present. Patient was scheduled with the gastroenterology department to evaluate the gallbladder for potential cholecystectomy.

4 | DISCUSSION

In the last three decades, invasive pyogenic liver abscess (PLA) has been increasingly reported worldwide, particularly in South-East Asia areas including Taiwan, Singapore, Thailand, Korea, and Vietnam. \textit{Klebsiella pneumoniae} is the most common organism recovered is cases of PLAs in Taiwan with 69% of 248 patients with PLA identified positive for \textit{K pneumoniae}.\textsuperscript{5} However, in Europe, \textit{K pneumoniae} is responsible for <6% of 53 PLA cases with positive
microbial cultures. In Northern America, *K. pneumoniae* has been identified in increasing percentage of PLA with a report from the New York stated that *K. pneumoniae* was present in 41% of the 54 cases in which an organism was recovered. In the New York study, however, *K. pneumoniae* was more commonly isolated among Asian than non-Asian patients (50% vs 27%).

The rmpA gene (for regulator of the mucoid phenotype A), a transcriptional activator of the capsular polysaccharide (CPS) genes, was proposed as a virulence determinant for *K. pneumoniae* liver abscess. Both plasmid-borne rmpA gene and chromosomal rmpA gene were identified in K1 type *K. pneumoniae*. rmpA gene expression has a strong correlation with capsular subtypes of virulent *K. pneumoniae* strains. As a result, rmpA was proposed as a marker of *K. pneumoniae* liver abscess.

**CONFLICT OF INTEREST**
The authors declare no conflicts of interest.

**AUTHOR CONTRIBUTIONS**
SHZ: conceived the idea for the manuscript and wrote the manuscript. SF and MM: were involved in the rehabilitation of the patient. All authors: read and approved the final version of the manuscript.

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