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Typical Presentation With Atypical Pathogen: A Case of Primary Hepatic Abscess Secondary to *Klebsiella pneumoniae*

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Background

- Hepatic abscesses can form due to different hosts and can be associated with various conditions and disorders, however, pyogenic liver abscess commonly develop after leakage of bowel contents that spread via the portal system circulation or via direct spread from a biliary infection; in the setting of a systemic bacterial infection, it can also manifest as hematogenous seeding.
- Hepatic abscess are the most common type of of intra-abdominal abscess, accounting for nearly 50% of cases with risk factors such as diabetes, underlying hepatobiliary or pancreatic disease.
- Most common anatomic site of hepatic abscess is the right lobe given its size and blood supply versus the left lobe. A common associated condition with this pathology is pylephlebitis, also understood as infective suppurative thrombosis of the portal vein, which carries significant morbidity and mortality with the infection.

Case Presentation

- A 66-year-old woman of Taiwanese descent with a history of uncontrolled Type II Diabetes Mellitus presented with 2 days of significant watery diarrhea, lightheadedness, and weakness. She denied any form of abdominal pain, subjective fevers, chills, night sweats, chest discomfort, or shortness of breath.
- Initial labs were consistent with Diabetic Ketoacidosis (DKA), acute kidney injury, and transaminitis in the 100-300 range. She was afebrile and hemodynamically stable. Upon diagnostic management on Day 1, she improved clinically with complete resolution of her DKA with stool studies non-diagnostic for any infection.
- On Day 2, she became acutely decompensated with a high grade fever, hypotension and generalized abdominal pain. Blood cultures drawn revealed gram negative rod (GNR) septicemia with subsequent ultrasound and CT scan of the abdomen demonstrating 7.5 x 6.6 x 3.9 cm left hepatic lobe abscess.
- Subsequent to IR-guided drainage, she rapidly deteriorated and developed altered mental status, distributive shock, and hypoxic respiratory failure requiring ventilator support.
- Her blood cultures returned positive for *Klebsiella pneumoniae*, and treatment with Ceftriaxone and Metronidazole, which initially appeared to control the infection failed to improve her clinical status. Given her persistent signs of systemic infection and lack of response to antibiotics along with ascending transaminitis and radiographic evidence of acalculous cholecystitis, a percutaneous cholecystectomy was performed.

- Unfortunately, her case became more complicated by this ascending cholangitis secondary to *Enterococcus faecium*. The GNR septic shock rapidly overwhelmed the patient with fulminant hepatitis, acute kidney injury, cardiomyopathy, altered mental status, and respiratory failure within 4 days of presentation despite maximal ventilator and CRRT support.

Test	Results
TSH	1.08 uIU/mL
Hepatitis A	Positive Ab Total IgG
Hepatitis B	Negative
Hepatitis C	Negative
Respiratory Viral Panel	Negative
Stool	Negative for Shiga, Yersinia, Vibrio, Salmonella, Giardia, Cryptosporidium, Clostridium Difficile
Stool O&P	Negative
Bile Culture	Enterococcus Faecium
D-Dimer	56.7 seconds - High
Haptoglobin	256 mg/dL - High
Fibrinogen	426 mg/dL - Normal
Prothrombin Time	34.7
PT INR	3.5
PTT	56.7
Troponin Peak	1.75 ng/mL
Lactate Peak	19.8 mmol/L
Ammonia	18 umol/L
Hemoglobin A1C	7.5%
Lipase	80 U/L

Microbiology	
Source	Organism
Blood Cultures x 2	<i>KLEBSIELLA PNEUMONIAE</i> Pansensitive
Urine Culture	No Growth x 24 hours
Bile Culture	<i>ENTEROCOCCUS FAECIUM</i> Pansensitive
Left Hepatic Lobe Abscess Culture	<i>KLEBSIELLA PNEUMONIAE</i> Pansensitive



Image 1. Plain film - Chest.



Image 2. CT Abdomen & Pelvis W/O Contrast.

- Impression:
- 7.5 x 6.6 x 3.9 cm hypodensity within the left hepatic lobe with foci of air peripherally is concerning for hepatic abscess. Additionally, there is mild prominence of the central intrahepatic and extrahepatic bile ducts and mild thickening of the gallbladder wall and common bile duct raising concern for cholangitis, although evaluation is limited due to lack of intravenous contrast.
 - Moderate sized bilateral pleural effusions, trace perihepatic ascites, and moderate amount of free fluid within the pelvis.



Image 3. Liver Abscess. A contrast-enhanced CT scan of the upper abdomen demonstrates a large gas-containing abscess in the right lobe of the liver. This location is easily amenable to percutaneous CT-guided drainage.

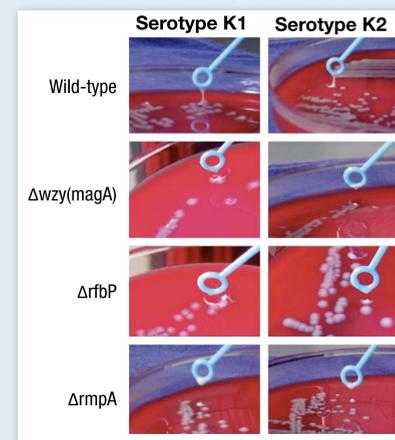


Image 4. Positive String Sign.

Siu, L Kristopher, Kuo-Ming Yeh, Jung-Chung Lin, Chang-Phone Fung, and Feng-Yee Chang. "Klebsiella Pneumoniae Liver Abscess: A New Invasive Syndrome." *The Lancet* 12 (2012): 881-87. Web. 6 Apr. 2015. <www.thelancet.com/infection>.



Image 5. Hyper-mucoviscous phenotype of *Klebsiella pneumoniae* suggested by the formation of a viscous string >10 mm in length when the colony was stretched with a standard bacteriologic loop. String sign is positive when > 5 mm in length.

FROM: A 51-Year-Old Man Presenting With Shock and Lower-Lobe Consolidation With Interlobar Bulging Fissure A Case of Shock With Lower-Lobe Consolidation. *Chest*. 2013;143(4):1167-1169. doi:10.1378/chest.12-2007. Copyright © American College of Chest Physicians. All rights reserved.

Discussion:

- Invasive liver abscess syndrome is characterized by a virulent strain of *Klebsiella* that causes bacteremia, hepatic abscess and metastatic infections. This virulent strain of *K. pneumoniae* and hepatic abscesses has been linked in case reports from Asian countries.
- Taiwan has the highest prevalence of this syndrome, with South Korea having the second highest prevalence.
- In 2005 and 2007, the first case reports confirmed the syndrome with the virulent strain, and both patients were Asian and presented in DKA.¹
- The organism is believed to be carried in the GI tract of healthy individuals and transmission may be possible secondary to the fecal-oral route and or environmental exposure.
- Major risk factors for this syndrome include uncontrolled diabetes and patients of Asian origin or descent. Patients have no history of hepatic disease and the abscess is monomicrobial. Patient can present with fevers, leukocytosis, and elevated liver enzymes in addition to progressing to septic shock.
- K. pneumoniae* isolated from Asian patients has a distinct phenotype and genotypic features and is much more virulent than strains found outside of Asia. These virulent strains exhibit a hypermucoviscosity phenotype which causes them to be sticky in nature.²
- The serotypes have been labeled as K1 and K2, which have a higher resistance to phagocytosis and intracellular killing by neutrophils and bactericidal complements.³
- The genes associated with this hypermucoviscosity phenotype have been identified as mucoviscosity-associated gene A (*magA*) and regulator of mucoid phenotype A (*rmpA*).²
- Almost all strains that cause liver abscess were positive for *rmpA* gene.³
- A positive string sign (> 5mm) is seen on agar plates of the invasive strain, which is not associated with the noninvasive strain.²
- The infection can become metastatic, with manifestations in the eyes, meninges and brain causing endophthalmitis, meningitis and brain abscess respectively. Diagnosis is confirmed via percutaneous drainage of the abscess with gram stain and culture and or positive blood cultures in addition to ultrasound or CT findings of liver abscess.
- Despite good prognosis, those patients with endophthalmitis have significant morbidity with impaired vision for life that is unresponsive to treatment.
- Poor outcomes have been seen in patients with septic pulmonary emboli or empyema.³
- Treatment involves drainage in addition to systemic antibiotic therapy, with antibiotic selection dependent of the resistance of the strain. Overall prognosis is good when identified and treated early and if progression to fulminant sepsis and metastasis are prevented.
- Cephalosporins are the preferred antibiotic, with combination treatment more frequently used in the US.
- Carbapenems are the drug of choice for ESBL-producing *Klebsiella pneumoniae*, although rare. Most isolates have a community acquired resistance pattern are usually pan-susceptible.³
- Treatment for single abscess is usually 2-4 weeks, and if multiple abscesses are present, then treatment up to 6 weeks is required.
- This case highlights the importance of recognizing this virulent serotype of *Klebsiella pneumoniae* as a potential pathogen in patients with hepatic abscess in East Asian descent. Further, it is important to understand the potential complications, prominently the metastatic component of *Klebsiella pneumoniae* infection and its timely treatment.
- The reported mortality in hospitals associated with the invasive syndrome is about 9-11%¹ especially in those patients that developed septic shock and metastatic disease.
- The disease is community acquired and patients are usually immunocompetent and have no underlying intestinal or hepatobiliary problems.²
- Any combination of febrile illness, hepatic fluid collection, possible CNS infection, and Southeast Asian descent should cause concern and raise the suspicion of this primary hepatic abscess syndrome caused by the hyper-virulent *Klebsiella pneumoniae* strain.

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