CASE REPORT

Citrobacter koseri: an unusual cause of pyogenic liver abscess

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SUMMARY

Liver abscess is a common pathology in the Indian subcontinent and usually results from amoebic or bacterial infection. Pyogenic abscesses usually occur in those with underlying predisposing factors like intra-abdominal infections, biliary infections or comorbidities like malignancy, immunosuppression, diabetes mellitus and previous biliary surgery or interventional endoscopy. *Citrobacter* is an unusual cause of pyogenic liver abscess and may occur in the setting of underlying comorbidities. We report a 56-year-old man with diabetes (operated for periampullary carcinoma 20 years ago), who presented with a history of fever for 1 week and on evaluation was found to have *Citrobacter koseri*-related hepatic abscess. The patient was managed with parenteral antibiotics, repeated aspiration of liver abscess and pigtail drainage.

BACKGROUND

Liver abscess refers to pus-filled lesions in the liver which can be attributed to bacterial, fungal or parasitic infections. Pyogenic liver abscesses (PLAs) account for majority of the cases in the Western nations whereas amoebic liver abscesses (ALAs) are more common in south eastern societies including India.¹ *Escherichia coli* and *Klebsiella pneumoniae* are the most common organisms isolated from PLA; other less common organisms may include *Pseudomonas*, *Enterococcus* and *Staphylococcus* species. *Citrobacter*, a Gram-negative bacterium belonging to Enterobacteriaceae, is a rare cause of liver abscess.² *Citrobacter* infections usually occur in patients with underlying comorbidities or immunosuppression.³ The infections caused by *Citrobacter* are difficult to treat with usual broad spectrum antibiotics owing to rapid generation of mutants and have therefore been associated with high death rates in the past.³ We hereby report a 56-year-old patient with diabetes who presented with fever and was diagnosed to have PLA. *Citrobacter koseri* species was isolated from the culture of the aspirate from liver abscess.

CASE PRESENTATION

A 56-year-old male presented to the emergency department with the chief complaints of intermittent fever for past 1 week associated with anorexia and vomiting. He was a known diabetic patient since 14 years taking oral hypoglycaemic agents. 20 years ago the patient had undergone Whipple's procedure prior for periampullary carcinoma. At presentation his blood pressure was 180/110 mm Hg, pulse rate 84/min and a respiratory

rate 24/min. He was afebrile and was maintaining an oxygen saturation of 95% on ambient air. The systemic examination was unremarkable except for tender hepatomegaly.

INVESTIGATIONS

His blood investigations revealed mild anaemia with haemoglobin 11.2 g/dl, a normal leucocyte count 8500/mm³ and a platelet count 210 000/mm³. His liver functions revealed elevated alanine transaminase 382 U/l (normal <40 U/l) and aspartate transaminase of 540 (normal <45 U/l) with a normal bilirubin level and hypoalbuminaemia (serum albumin 2.3 g/dl, normal 3.5–5 g/dl). He had a normal coagulation profile (prothrombin time 14 s and control 13 s). His random blood glucose was 480 mg/dl. Urine ketones were negative. Kidney function tests revealed an elevated blood urea 88 mg/dl (normal <40 mg/dl) and a normal serum creatine 1.3 mg/dl (normal <1.4 mg/dl). He had serum sodium level 124 mEq/l (normal 135–145 mEq/l) and potassium level 4.3 (normal 3.5–5 mEq/l). Abdominal ultrasonography showed an enlarged liver (17.5 cm) with a large heterogeneous lesion in the liver measuring 10.5 × 9 cm in the right lobe with minimal liquefaction. The patient also had an atrophic and scarred right kidney most likely a sequel of chronic pyelonephritis. The CT showed a large heterogeneous mass lesion with septae in the right lobe (figure 1).

DIFFERENTIAL DIAGNOSIS

The three major causes of liver abscess include amoebiasis, bacterial or fungal infection. Amoebiasis is mostly prevalent in subtropical and tropical areas under conditions of overcrowding, poor sanitation and poor nutrition. ALA represents the most common extraintestinal manifestation of infection with *Entamoeba histolytica*. PLAs, however, result from bacterial infection and usually occur in immunocompromised individuals. Historically most cases of PLAs resulted from portal pyaemia occur as a result of intra-abdominal infection. With the increasing use of antibiotics this presentation is less common with most cases now being cryptogenic. Underlying diabetes mellitus, malignancy, immunosuppressive states, previous biliary surgery or interventional endoscopy are a few conditions predisposing for the development of liver abscess. Hepatic candidiasis, tuberculosis and actinomycosis are seen in immunocompromised patients and those with haematological malignancies.

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Figure 1 Axial contrast-enhanced CT of the upper abdomen showed an enlarged liver with a large heterogeneous mass lesion with septae in the right lobe.

TREATMENT

The liver abscess was drained under ultrasound guidance and 60 ml brownish purulent fluid was aspirated and sent for culture sensitivity testing. The patient was started on intravenous metronidazole 2.5 g/day in three divided doses and amikacin 750 mg once daily. The patient was also started on multiple subcutaneous insulin injections and amlodipine. His titres for amoebic and hydatid serologies were low. The culture of the aspirate from the abscess revealed growth of *C koseri*. The antibiotics were changed to cefotaxime 1 g thrice daily and ertapenem as per the sensitivity report. Even after 8 days of antibiotic therapy the fever did not subside. The repeat ultrasound showed a larger abscess of 14.6×11.4 cm with a few cystic areas with a right pleural effusion. Repeat aspiration was performed and around 300 ml of pus was removed and pigtail insertion was carried out. The antibiotics were changed to imipenem-cilastatin and ciprofloxacin. The aspirate was negative for acid-fast bacilli, malignant cells and fungal stain and culture. The serum α -fetoprotein was 3 ng/ml (normal <4 ng/ml).

OUTCOME AND FOLLOW-UP

The patient improved over next 3 days and became afebrile, and the pigtail was removed after 1 week. The patient was discharged on oral faropenem and ciprofloxacin for another 4 weeks.

DISCUSSION

PLAs are an important cause of hepatic abscesses.⁴ The liver can also be invaded by bacteria by ascending cholangitis from the biliary system, from the hepatic artery secondary to bacteraemia or traumatic implantation of bacteria through the abdominal wall. The aetiological factors and microbiological profile of PLAs differ with respect to Asian and western population. Most of the case series from south-east Asia implicate *K pneumoniae* as the major causative organism of PLAs, whereas western studies show predominance of *E coli* as the major causative organism.^{5 6} Rarely, hepatocellular carcinoma can present as pyogenic abscess because of tumour necrosis, biliary obstruction and superimposed infection.⁷

Citrobacter species are rare causes of neonatal infections and may cause a wide spectrum of infections in the immunocompromised adults. They are aerobic, Gram-negative bacilli

belonging to Enterobacteriaceae family. Among the various species, *C koseri* (formerly *C diversus*) has been implicated in the causation of neonatal meningitis and sepsis in majority of the cases.⁸ A retrospective study from Taiwan on *Citrobacter* bacteraemia reported 45 patients over a period of 13 years.³ Patients with malignancies (48.9%—mostly intra-abdominal) or hepatobiliary stones (22.2%) were found to have high predilection for *Citrobacter* bacteraemia. Abdominal cavity (51.1%) was the most common site for initial infection, other sites being urinary tract (20%) and lung (11.1%).³ Intra-abdominal infections included hepatobiliary tree infection (including three patients who had liver abscesses), peritonitis and perianal abscess.³ Another report of three cases noted two patients one with *Citrobacter*-related iliopsoas abscess and another patient with renal and liver abscess in a patient with diabetes owing to *C koseri*.⁹

Therefore, only a few reports of PLAs implicate *Citrobacter* species as the causative organism. The patient in discussion was a patient with diabetes with a history of Whipple's procedure for periampullary carcinoma prior to 20 years. The initial aspirate yielded *C koseri* which, however, did not respond to the antibiotics as per sensitivity report. The earlier reports suggest that *Citrobacter* infections are resistant to treatment with antibiotics alone and the percutaneous aspiration has elicited favourable responses in such patients.⁴ It was observed in the study on *Citrobacter*-related bacteraemia that use of a cephalosporin within 14 days promoted the emergence of cefotaxime-resistant strains and multidrug-resistant strains.³ Another study at a north Indian tertiary institute depicted a high degree of resistance to the third-generation and the fourth-generation cephalosporins, as well as to piperacillin, gentamicin and ciprofloxacin.¹⁰ In spite of the antibiotics according to sensitivity reports patient's condition showed a steady deterioration and his blood sugar remained poorly controlled. The patient, however, improved with drainage and change of antibiotics.

The present case highlights *Citrobacter* as a rare cause of PLA. The report also highlights the need to be vigilant to the possibility of unusual organisms as a cause of liver abscess in patients with underlying comorbidities like diabetes. Although the initial outcomes were somewhat unsatisfactory with conservative treatment alone, but complete recovery was achieved after combining invasive intervention with medication.

Learning points

- ▶ The presentation of pyogenic liver abscesses (PLAs) is often non-specific and its diagnosis requires a high degree of clinical suspicion.
- ▶ *Citrobacter koseri* abscess is predominantly an opportunistic or a nosocomial pathogen; however, may infect immunocompetent individuals.
- ▶ *C koseri* should be considered as a possible aetiology in all PLAs which show a delayed resolution to conservative medical management.

Competing interests None.

Patient consent Obtained.

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