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Case report

A novel case of *Raoultella* bacteremia secondary to liver abscess formation following transarterial chemoembolization

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ABSTRACT

Raoultella planticola is an uncommon gram-negative bacterium that has rarely been identified as the causative organism in severe infections. Few cases have been described and have included patients with pneumonia, urinary tract infections or cholangitis. Only one case has reported to involve a liver abscess, thought to be from a primary urologic source. We describe the case of a 73-year-old man with recently diagnosed hepatocellular carcinoma who developed multiple pyogenic liver abscesses. The abscesses were thought to have developed in the setting of recent transarterial chemoembolization leading to *R. planticola* bacteremia noted on admission. Treatment with ceftriaxone and metronidazole was initiated in addition to drainage of the abscesses, resulting in decreased size of liver collections and initial clinical improvement. *R. planticola* remains a rare infectious organism in severe infections affecting both immunocompromised and immunocompetent individuals. Our patient's underlying malignancy and recent transarterial chemoembolization likely placed him at risk of liver abscess formation complicated by bacteremia and sepsis.

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Introduction

Raoultella planticola is a rare environmental gram-negative organism that until recently, was not commonly associated with clinically significant infections. There has been a rise in frequency of infections secondary to this microbe over the past several years and it has been shown to cause severe infections, particularly in immunocompromised individuals [1]. This case underlines not only the emergence of a rare infectious organism in both immunocompetent and immunocompromised individuals but also the importance of recognizing liver abscess formation as a significant complication following transarterial chemoembolization.

Case

A 73-year-old male presented with one week of altered mental status, decreased appetite and poor oral intake. His medical history included hepatocellular carcinoma, history of alcohol use, congestive heart failure, as well as coronary artery disease and chronic kidney disease. He previously was a floor maker for 40 years. There was history of alcohol abuse and cigarette smoking, which he stopped 20 years and 40 years prior, respectively.

Upon presentation to the emergency department, the patient was afebrile, hypotensive, and hypoxic. Physical examination was unremarkable except for mild tenderness in his right upper quadrant. He was in shock and was admitted to the intensive care unit for hemodynamic support. Blood work was notable for mildly elevated liver transaminases. Blood cultures were obtained, and he was started on empiric antibiotic therapy with vancomycin, cefepime and metronidazole. Chest X-ray and urinalysis on admission were unremarkable. A CT of the abdomen was obtained with an initial read indicative of an interval increase in intrahepatic metastatic disease with multiple new and enlarging metastases.

Four months prior to this admission, patient was diagnosed with hepatocellular carcinoma. Imaging at diagnosis revealed a well-defined solid-appearing mass in the left liver lobe. Biopsy was consistent with moderately differentiated hepatocellular carcinoma. In light of a recent MI, he was considered a poor surgical candidate and treatment consisted of transarterial chemoembolization (TACE). He required a second TACE procedure leading to post-procedure admission for chest pain and sepsis of unclear origin. CT abdomen at that time showed an embolized left hepatic mass as well as ill-defined hypodensities in the left liver which were new since prior, thought to be hepatic infarcts. Five weeks

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later, he presented for the current admission. Abdominal CT was obtained on admission which, as noted above, showed multiple new and enlarging masses suggestive of metastatic disease (Figs. 1 and 2). It was soon determined that these masses were in fact not metastases but liver abscesses.

Blood cultures from admission grew *Raoultella planticola* (Fig. 3) in both sets. Intermediate sensitivity to ampicillin was seen, otherwise sensitive to cephalosporins and quinolones. Antibiotics were narrowed to ceftriaxone and metronidazole. Two drains were placed by Interventional Radiology on hospital day four with fluid revealing elevated white blood cells however no growth on culture likely secondary to antibiotic use prior to drainage. Repeat imaging showed decrease in size of the masses. Overall clinical status significantly improved, and he was subsequently discharged on IV ceftriaxone and oral metronidazole to complete 6 weeks of antibiotic therapy. Unfortunately, patient was re-admitted about four weeks into therapy with progressively worsening lesions and overall decompensation. Due to continued decline, family pursued a more comfort-based approach and patient subsequently expired.

Discussion

Raoultella planticola is a gram-negative, aerobic, non-motile, encapsulated bacillus bacterium from the Enterobacteriaceae family that is commonly found in water, soil, and aquatic environments. Formerly named *Klebsiella planticola*, it was reclassified in 2001 as a new genus *Raoultella* after French microbiologist Didier Raoult [1]. Human reservoirs include the gastrointestinal and upper respiratory tracts. Few cases of *Raoultella* have been reported to date and have been found to cause a variety of clinically significant infections, including gastroenteritis [2], pneumonia [3], urinary tract infection [4], prostatitis [1], surgical site infection [5] and cholangitis [6]. Bacteremia, sepsis, and death have also been reported [7]. One other incidence of liver abscess was noted in the literature in 2016, in the setting of a urinary tract infection [8]. A retrospective study of 20 patients by Chun and Yun in 2014 [9] characterized clinical features of patients with *Raoultella planticola* bacteremia and found most infected patients to be immunocompromised with underlying malignant conditions. Several cases have been associated with seafood ingestion [2,10], which our patient denied. With infections being so rare, pathogenesis of infection is not yet fully understood and further research may be required to determine risks of infection and ideal management. Prior case reports have shown that empiric treatment using broad-spectrum antimicrobials with gram-negative coverage is sufficient, with a more targeted therapeutic approach once sensitivities become available [11,12]. Some cases have shown evidence of resistance, such as ampicillin as seen in our patient. Though he was not actively on immunosuppressive agents, his underlying hepatocellular carcinoma may have placed the patient at a higher risk for developing the *Raoultella* infection following the TACE causing formation of the liver abscesses.

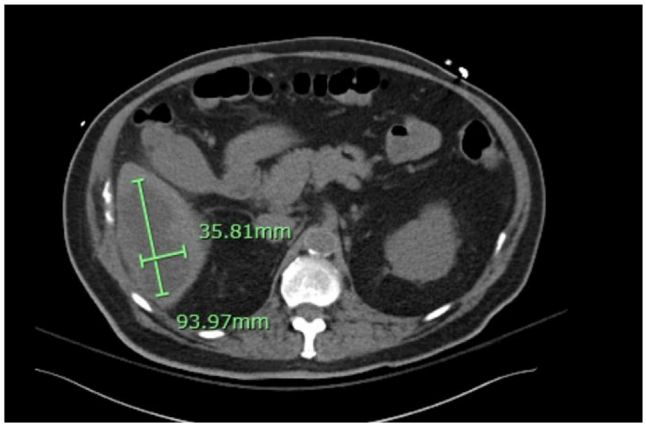

Fig. 1. Contrast CT of the abdomen showing a liver collection in the left lobe with dimensions noted.

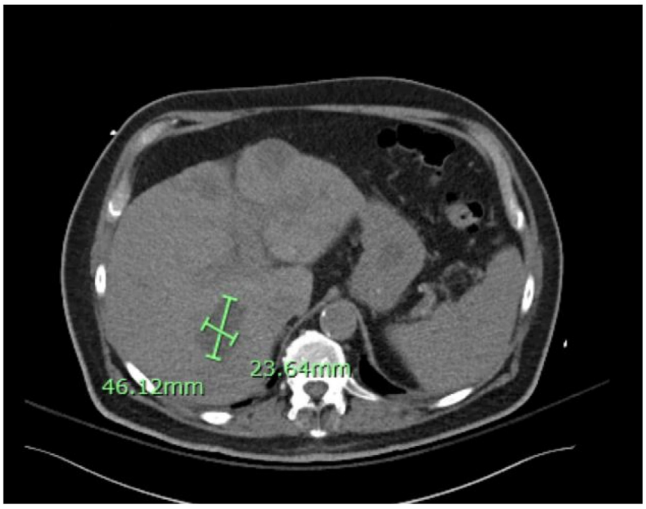

Fig. 2. Contrast CT of the abdomen showing a second liver collection with dimensions noted.

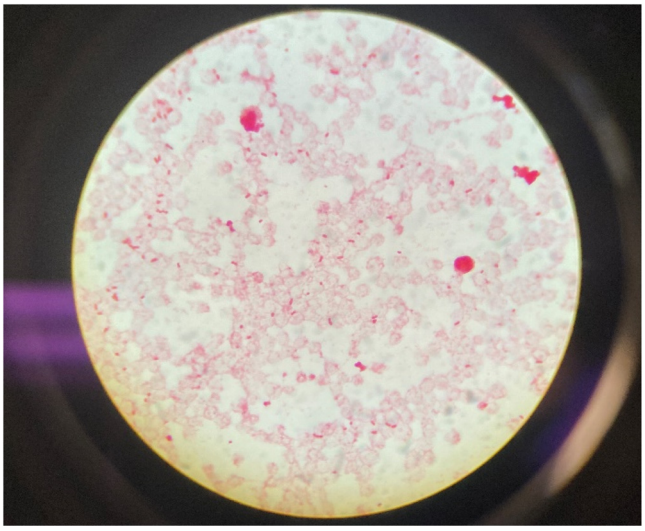

Fig. 3. Direct microscopy of Raoultella Planticola showing gram negative bacilli on gram stain.

Pyogenic liver abscesses are an important cause of morbidity and mortality that typically result from an underlying source that must be controlled to prevent recurrence [13]. Biliary tract disease is the most common cause of pyogenic liver abscess formation and includes cholelithiasis, choledocholithiasis, strictures or tumors as well as congenital biliary tree abnormalities. The second most common cause is portal vein seeding from a bowel or pelvic infection, such as appendicitis [14]. Our case illustrates another important cause increasing in frequency over the years involving hepatic artery seeding in the setting of thrombosis, that can result after hepatic artery chemoembolization. In some cases, an abscess can develop directly from an adjacent infection or in the setting of penetrating trauma. In regard to microbiology, the most common

isolated pathogens depend on geography and tend to include *Escherichia coli* and *Klebsiella* pneumoniae, as well as Enterococcus and Streptococcus [15,16]. In cases of penetrating trauma, skin flora such as *Staphylococcus aureus* has been identified [17]. Unlike our case in which a gram-negative bacillus was the causative infectious agent, *Staphylococcus aureus* and other gram-positive organisms are most commonly the predominant pathogens seen following transarterial chemoembolization [17].

Summary

We present a case of *R. planticola* bacteremia following TACE leading to hepatic abscess formation. *Raoultella* is an uncommon organism that has only rarely been identified as the causative pathogen in severe infections and bacteremia. Though infections have been reported such as pneumonia, urinary tract infection, or cholangitis, only one other previous infection involving liver abscess has been reported. As discussed, previous cases were identified in patients with underlying malignancy, most often undergoing chemotherapy or exposure to other immunosuppressants. The most likely risk factors for the development of infection in our patient were his underlying liver malignancy and recent TACE procedure.

Author contribution

Thomas Erwes – writing.
Jessica Abrantes-Figueiredo – writing.

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Consent

Consent not obtained for case report as patient passed away since reported encounter. No identifiable information that can be associated with the patient is included in the case report.

Declaration of Competing Interest

The authors report no declarations of interest.

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None.

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