Klebsiella pneumoniae K1 Liver Abscess and Septic Endophthalmitis in a U.S. Resident

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Klebsiella pneumoniae K1 is a major agent of hepatic abscess with metastatic disease in East Asia, with sporadic reports originating elsewhere. We report a case of abscess complicated by septic endophthalmitis caused by a wzyA-positive Klebsiella strain in a U.S. resident, raising concern for global emergence.

CASE REPORT

A 58-year-old female resident of Bronx, New York, who was originally from the Dominican Republic presented with a chief complaint of 1 day of decreased vision in her right eye and concomitant symptoms, including weakness, myalgia, low-grade fever, and right upper quadrant pain for 1 week. She had a history of uncomplicated choledochal cyst resection and Roux-en-Y hepaticojejunostomy approximately 5 years prior to presentation but no history of ocular disease or prior intraocular surgery. She reported subsequent travel to the Dominican Republic but denied travel to Asia at any point before or after her surgery. On the initial ophthalmic examination, visual acuity was 20/60 in the affected eye. Slit-lamp examination revealed moderate conjunctival injection in the right eye, along with 4+ cells and hypopyon in the anterior chamber. The fundus view was hazy because of opacity in the anterior segment, but the retina was flat. She was diagnosed with presumed endogenous endophthalmitis. Her vision in the affected eye worsened over the next 24 h. Because of right upper quadrant tenderness on examination, further imaging was performed, revealing a hepatic abscess (7 by 7 by 7 cm) (Fig. 1). The patient reported no history of diabetes, and the serum glucose was normal. She was treated with intravenous levofloxacin, and the abscess was drained percutaneously. Cultures of liver aspirate, blood, and urine grew Klebsiella pneumoniae susceptible to expanded- and broad-spectrum cephalosporins, ampicillin-sulbactam, levofloxacin, aminoglycosides, and trimethoprim-sulfamethoxazole. The isolate exhibited a hypermucoviscous phenotype, as exemplified by a positive string test (Fig. 2). On the seventh hospital day, her ophthalmologic exam deteriorated; she was found to have a subretinal abscess in the peripheral temporal retina, and retinal detachment was noted (Fig. 3). A sample of vitreous fluid was obtained, which revealed polymorphonuclear leukocytes on Gram stain but a negative culture, and intravitreal injection of ceftazidime was performed. Over the next several weeks, the vitreous debris cleared, and the retina more clearly assumed the configuration of a bullous rhegmatogenous detachment stemming from a break related to the retinal necrosis at the site of the subretinal abscess. The patient underwent a vitrectomy for retinal detachment 2 months after her initial presentation. The patient’s subsequent course was complicated by a relapse of abdominal pain and an increase in size of the liver abscess following a transition to oral therapy. An abdominal CT scan conducted 2 months after the completion of an 8-week antibiotic course demonstrated resolution of her liver abscess.

Because of the similarity of this case to reports from Asia, we conducted PCR to identify the K1-specific wzyA allele (wzyAKpK1) in the K. pneumoniae isolate from this patient. We detected both wxy and wzyAKpK1 alleles using previously published methods and primer sequences (1). Each of these amplicons was purified, and bidirectional Sanger sequencing resulted in >950 bp of sequence for each. For each allele, the generated sequence was 100% identical to the corresponding genes from the published K1 K. pneumoniae NTUH-K2044 strain (GenBank accession no. AP006725.1) (2).

Serotype K1 Klebsiella pneumoniae has emerged as a major cause of pyogenic liver abscess in East Asia, and such infections frequently result in metastatic complications, including endophthalmitis, necrotizing fasciitis, meningitis, and cerebral and pul-
The striking emergence of this clinical syndrome has been reviewed in detail recently (5). The implicated K. pneumoniae strains are generally hypermucoviscous, and their virulence is dependent on the \textit{wzyA} \textit{KpK1} (formerly called \textit{magA}) gene, which is specific to the K1 serotype (6,7). \textit{wzyA} \textit{KpK1} encodes a polymerase involved in the assembly of the K1 antigen (7, 8). Other important virulence factors in these \textit{Klebsiella} strains include the \textit{rmpA} gene, which regulates synthesis of the capsule, and aerobactin, a catecholate siderophore (9–12). Despite numerous reports confirming the association of this distinctive clinical presentation with \textit{K. pneumoniae} in Asia, descriptions of K1-associated pyogenic abscesses with ophthalmologic complications originating outside this region are less frequent (5, 13).

Laboratory-confirmed invasive \textit{K. pneumoniae} liver abscess syndrome has been described in North America, primarily in patients of Asian descent (14–18), but only occasional reports have described molecular strain typing to confirm the K1 strain as the causative agent (19). Recently, a Caucasian man from San Diego, CA, was found to have laboratory-confirmed K1-associated recurrent liver abscesses without endophthalmitis (20). There are only sporadic descriptions of ophthalmologic complications of \textit{K. pneumoniae} hepatic abscess in the United States (21–23), but none of these reported serotyping or molecular confirmation of the K1 strain. The patient presented above represents confirmation of a \textit{wzyA} \textit{KpK1}-positive \textit{K. pneumoniae} K1 strain causing pyogenic liver abscess and endophthalmitis in a U.S. patient. This individual did not report Asian lineage or known close contacts from that region. In prior series, affected patients have generally lacked known immunodeficiency, as was the case with this individual, and have had normal hepatobiliary anatomy. It is unclear what role our patient’s prior biliary surgery may have played in the pathogenesis of her disease, though it is conceivable that her altered anatomy may have been a predisposing factor. Gastrointestinal carriage of the K1 strain is likely a risk factor for development of \textit{K. pneumoniae} liver abscess (24). Diabetes is a frequent underlying illness in reports of \textit{K. pneumoniae} hepatic abscess (5,25), but our patient lacked that putative risk factor as well. Clinicians should be aware that the hypervirulent \textit{Klebsiella pneumoniae} K1 strain is emerging worldwide. Patients presenting with \textit{K. pneumoniae} pyogenic abscess should be closely evaluated for central nervous system involvement or sight-threatening ophthalmologic complications.

REFERENCES
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