

# Rare case of endogenous *Klebsiella* endophthalmitis associated with emphysematous prostatitis in a patient with diabetes, cirrhosis and COVID-19

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## SUMMARY

A 35-year-old Hispanic man presented with fever, chills, dysuria, diarrhoea, scleral icterus, tachycardia and tachypnea. He was found to be COVID-19 positive, CT of the pelvis revealed prostatic abscess, and urine culture grew *Klebsiella pneumoniae*. Additionally, he was found to have diabetes and cirrhosis. During treatment, the patient developed vision loss, and was diagnosed with endogenous *Klebsiella* endophthalmitis. The patient was treated with intravenous antibiotics, pars plana vitrectomy, intravitreal antibiotics and cystoscopy/suprapubic catheter placement. On follow-up, the patient has had the suprapubic catheter removed, and successfully passed a voiding trial, but suffers permanent vision loss in both eyes.

## BACKGROUND

Emphysematous prostatitis is a rare condition in which infection leads to gas formation within the prostate. Endogenous endophthalmitis is an uncommon secondary infection caused by haematogenous spread from a primary source. This is a rare case of a patient who developed endogenous endophthalmitis from suspected emphysematous prostatitis. This case serves to highlight key features of these diseases while emphasising the diagnostic challenges of patient care during the COVID-19 pandemic, as well as the importance of addressing social determinants of health.

## CASE PRESENTATION

A 35-year-old Hispanic man with no known significant medical history presented to an outside facility's emergency room with shortness of breath. The patient had been recently seen at an urgent care clinic due to several days of chills, fever, dysuria and diarrhoea. Given the ongoing COVID-19 pandemic, he was tested for COVID-19 which was at that point negative. He was then prescribed azithromycin and cefdinir for pneumonia. Several days later, he returned to the urgent care facility complaining of new onset of yellowing eyes and haematuria. He was found to be tachypneic and was sent to the emergency room.

In the emergency department, the patient was found to be tachypneic and tachycardic. Laboratory tests revealed marked leukocytosis, elevated creatinine, hyponatraemia, transaminitis and hyperbilirubinaemia and positive test to SARS-Cov-2. CT

of the chest, abdomen and pelvis demonstrated multiple pulmonary nodules, as well as a prostate abscess extending into the penis. Urine cultures grew *Klebsiella pneumoniae*, blood cultures were negative and a transthoracic echocardiogram (TTE) did not show any valvular vegetations. The patient was initially treated empirically with therapeutic enoxaparin for anticoagulation of suspected pulmonary embolism in the setting of COVID-19 hypercoagulability, and ceftriaxone for possible urinary tract infection. Enoxaparin was stopped when the patient developed haematochezia and gross haematuria. Antibiotic coverage was broadened to vancomycin and meropenem. Several days into his hospital course, he developed vision loss with no associated pain or redness. This vision loss started in the left eye, but very quickly involved the right eye as well. MRI of the brain with and without contrast was negative for stroke, haemorrhage or mass lesion, however, clinical ophthalmological examination was concerning for bacterial endophthalmitis bilaterally. He was then transferred to our hospital for further evaluation and treatment.

On presenting to our institution, the patient was experiencing persistent watery diarrhoea, worsening painless vision loss bilaterally, and gross haematuria. His physical examination revealed jaundice, obesity and tachycardia. His best-corrected visual acuity was light perception (LP), bilaterally. Anterior ophthalmic examination revealed scleral icterus and posterior synechiae but was otherwise normal, bilaterally. Fundus examination not possible due to dense yellow vitritis in both eyes.

## INVESTIGATIONS

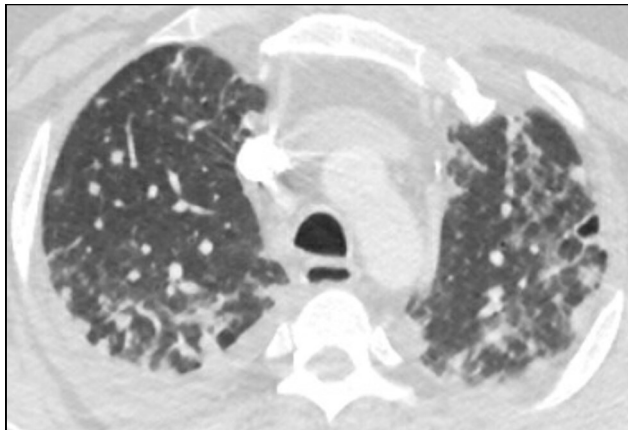
On transferring to our institution, repeat testing for SARS-CoV-2 was negative. Further laboratory testing was significant for a haemoglobin A1c 6.7 (%), haemoglobin 79 (g/L), albumin of 2.0 (g/dL), total bilirubin 4.9 (mg/dL), direct bilirubin 3.5 (mg/dL), aspartate aminotransferase (AST) 54 (U/L), alanine aminotransferase (ALT) 47 (U/L), D-Dimer 6427 (ng/mL fibrinogen equivalent units (FEU)), C-reactive protein (CRP) 131 (mg/L), procalcitonin 6.3 (ng/mL), blood urea nitrogen (BUN) 27 (mg/dL) and creatinine 0.7 (mg/dL).

CT of the chest was negative for pulmonary embolism but revealed scattered nodular opacities, some of which were cavitory, concerning for septic emboli (see [figure 1](#)). In addition, CT of the abdomen and pelvis demonstrated prostatitis



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**Figure 1** CT of chest with contrast showing nodular opacities and cavitation in the left upper lobe.

and liver cirrhosis which was later confirmed by abdominal ultrasound. Given the concern for possible pulmonary septic emboli, a TTE was performed to evaluate for infective endocarditis which showed no abnormalities. MRI of the orbits was consistent with bilateral endophthalmitis. B-scan revealed dense vitreous opacities in both eyes.

Blood cultures and repeat urine cultures were negative; however, the patient had already been on antibiotics for 9 days, including 3 days of cefdinir and azithromycin, followed by 5 days of ceftriaxone, followed by 1 day of vancomycin and meropenem. Cultures were obtained from the eye during pars plana vitrectomy (PPV) as well, which yielded *K. pneumoniae*.

### DIFFERENTIAL DIAGNOSIS

This patient had sepsis with prostatic, ocular, pulmonary and hepatic involvement, in the setting of a recent positive SARS-CoV-2 test and a recent urine culture growing klebsiella. This put disseminated klebsiella infection high on the differential list. However, it was still unclear what, if any, of his signs and symptoms could be attributed to COVID-19 infection and/or COVID-19 associated coagulopathy. The prostatic involvement was attributed to Klebsiella cystitis and prostatitis. Regarding his pulmonary disease, CT scan ruled out acute pulmonary embolism as the cause of his hypoxia, but the nodular and cavitary opacities seemed like possible septic emboli from the prostate infection versus due to COVID-19 pneumonia. Similarly, with regard to endophthalmitis, possible aetiologies included septic emboli from the prostate versus infection secondary to COVID-19 coagulopathy. With regard to the aetiology of his hepatic disease, alcoholic liver disease vs non-alcoholic steatohepatitis versus COVID-19-associated liver dysfunction were on the differential. Finally, with his elevated haemoglobin A1c, he was newly diagnosed with diabetes.

The patient underwent bilateral PPV on the first day of hospitalisation in our facility, at which point intravitreal vancomycin and ceftazidime were administered in both eyes. Systemic intravenous antibiotics were upgraded to cefepime which had klebsiella coverage and better intraocular penetration; vancomycin was thought to be unnecessary as methicillin-resistant *Staphylococcus aureus* (MRSA) was considered unlikely. Therapeutic anticoagulation with a heparin infusion was started due to concern for COVID-19 associated microcirculatory thrombosis and coagulopathy in the setting of elevated D-dimer and inflammatory markers in a patient with a recent positive SARS-CoV-2.

Finally, for his low haemoglobin (79) and haematuria, one unit of packed red blood cells was transfused.

### OUTCOME AND FOLLOW-UP

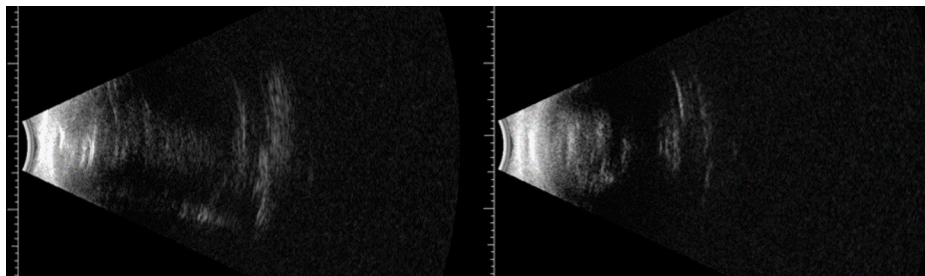
During the patient's hospital course, cultures taken from the eye during PPV grew pan-sensitive *K. pneumoniae*, confirming septic emboli from the prostate as the likely aetiology of eye infection (given the previously positive urine cultures at the outside hospital). Antibiotics were then de-escalated to ceftriaxone. Repeat CT scan of the pelvis revealed a prostate abscess with infection spreading to the left seminal vesicle and the base of the penis. At this same time, the patient had another episode of bright red blood per rectum, at which point heparin infusion was stopped. Esophagogastroduodenoscopy and colonoscopy were performed given his multiple episodes of gastrointestinal bleeding. No oesophageal varices were found, and lower gastrointestinal bleed was determined to be from internal haemorrhoids. Given concern for septic emboli a full TTE was performed which did not show any signs of endocarditis, though it was unable to be ruled out completely due to the low sensitivity of the study. Subsequently, a transesophageal echocardiogram was performed which was negative for endocarditis as well.

The patient's vision in the right eye worsened to no LP (NLP), with clinical examination of the right eye concerning for worsening infection, which led to another intravitreal injection of vancomycin and ceftazidime. Repeat MRI of the orbits was performed to evaluate the patient's increasing right eye proptosis; he was found to have periorbital and orbital cellulitis, leading to a diagnosis of pan-ophthalmitis in his right eye. Antibiotics were changed to ceftazidime and levofloxacin for better ocular penetration. Given the worsening eye infection, CT of the pelvis was repeated to evaluate for source control of the prostatic abscess. Imaging revealed an unchanged prostatic abscess but new bilateral internal iliac vein thrombosis. Therapeutic heparin infusion was restarted after an extensive risk vs benefit discussion with the patient. The patient underwent cystoscopy, transrectal ultrasound (TRUS) and suprapubic catheter placement by urology; no abscess was visualised, and the urethra had multiple cavitations and false passages. The prostate was difficult to distinguish, as there was necrotic, inflamed tissue in the prostatic fossa. Due to this intraoperative finding, a diagnosis of emphysematous prostatitis was considered. Due to hematuria with worsening anaemia, anticoagulation was stopped, and an inferior vena cava filter was placed.

The patient began improving clinically, and on day 20 in our hospital, his endophthalmitis appeared to be resolving as well. He was then transferred back to the original facility where he initially presented with symptoms of dyspnoea. Six weeks after discharge from our hospital, this patient continues to follow-up with primary care, urology, and ophthalmology. In a recent follow-up visit with ophthalmology, the patient had no residual signs of inflammation or infection, but his visual acuity was NLP in his right eye and LP in his left eye, and he was referred for low-vision services. Follow-up B-scan (figure 2) reveals vitreous debris in both eyes. In a follow-up visit with urology, the patient's suprapubic catheter and then foley were removed, and he was able to successfully pass a voiding trial.

### DISCUSSION

Bacterial endophthalmitis can be categorised as either the more common exogenous endophthalmitis (associated with penetrating ocular trauma or surgery) or the relatively rarer endogenous endophthalmitis (caused by haematogenous spread).<sup>1</sup> In



**Figure 2** B-scan of both eyes at follow-up showing vitreous debris.

the USA and Europe, the most common source of endogenous endophthalmitis is endocarditis, and the most common organisms are streptococci and *S. aureus*<sup>12</sup>; however, in Asia, the most common source is liver abscess, and the most common organism is *K. pneumoniae*.<sup>3</sup>

Endogenous *K. pneumoniae* endophthalmitis (EKE) is often associated with liver abscess, diabetes, and very poor visual outcomes, with 72%–89% of patients final VA in the affected eye of count fingers or less.<sup>4</sup> A review of the literature reveals three cases of EKE where the source of infection was prostatitis<sup>5–7</sup>; in two of these cases, the patient was a heavy alcohol user and was newly diagnosed with diabetes. In a fourth case,<sup>8</sup> a man with *K. pneumoniae* liver abscess later developed both prostatitis and EKE. However, there are no reported cases of emphysematous prostatitis leading to EKE.

Emphysematous prostatitis is a rare condition characterised by gas formation in the prostate. In the few cases reported, there is an association with diabetes, alcohol use, and liver cirrhosis, with the most common causative organism being *K. pneumoniae*.<sup>9–11</sup> In our case, imaging never revealed emphysematous changes in the prostate, but intraoperative findings of necrotic, inflamed prostate tissue during cystoscopy and TRUS led us to consider this diagnosis. Furthermore, the patient was on several different antibiotics for approximately 7 days prior to presenting at our institution, and so any emphysematous changes could have resolved by the time he presented.

Our case is also rather atypical from the reported cases in the literature due to the presence of COVID-19. Of the many clinical problems our patient developed, it was hard to know which to attribute to COVID-19 infection. For example, while *Klebsiella* prostatitis causing pulmonary abscess from septic emboli has been reported,<sup>12</sup> it was initially unclear if our patient's pulmonary disease could be attributed to COVID-19-associated pneumonia, secondary bacterial infection, or septic emboli. In addition, regarding our patient's hepatic involvement, he presented with cirrhosis, hyperbilirubinaemia, mild transaminitis, mild alcohol use and obesity. Given the strong link between *K. pneumoniae* and hepatic abscess,<sup>13</sup> this was a likely possibility at that point. However, given negative imaging, the aetiology could still be the hepatobiliary manifestations of COVID-19,<sup>14</sup> alcoholic liver disease, non-alcoholic steatohepatitis or autoimmune hepatitis.

It is also worth noting that, from before our patient had any visual symptoms, he was continuously on systemic antibiotics, including ceftriaxone, meropenem, cefepime and finally ceftazidime. All these antibiotics should have sufficient intraocular penetration into an inflamed eye to lead to a vitreous concentration greater than the minimum inhibitory concentration of 90% of isolates (MIC90) for *Klebsiella*.<sup>15 16</sup> Despite this, the patient's endophthalmitis continued to progress until PPV and multiple intravitreal injections of antibiotics. This case serves to highlight the importance of early intervention in EKE.

Finally, the importance of the social determinants of health and their effect on this case cannot be ignored. Our patient is a Spanish-speaking Hispanic immigrant, all of which put him at increased risk of significant morbidity.<sup>17 18</sup> This is exacerbated by the ongoing pandemic of COVID-19, which our patient had, a disease which already has mounting evidence of significant healthcare disparities by race and ethnicity.<sup>19 20</sup> This case, therefore, also serves as a reminder of the societal need to address social determinants of health in order to improve public health.

### Patient's perspective

Since leaving the hospital, I'm feeling better, except for my vision which is not getting better. I'm not used to getting around without my sight. I can't drive, or even see my family. I have not been able to work, and my family had to make big changes because of this. It's been difficult getting to so many doctor's appointments. In the hospital, I was scared because of the pandemic and how many people are dying from it. But I am thankful now to be feeling better and home with my family.

### Learning points

- ▶ Emphysematous prostatitis is a rare but potentially fatal condition associated with *Klebsiella pneumoniae* requiring aggressive antimicrobial treatment along with surgical intervention for source control.
- ▶ Endogenous *K. pneumoniae* endophthalmitis is a rare secondary infection with a poor visual prognosis requiring early surgical intervention and aggressive antimicrobial treatment.
- ▶ The ongoing COVID-19 pandemic has presented a variety of clinical challenges: the disease itself is associated with a multitude of signs and symptoms, complicating diagnosis and the pandemic has exacerbated the effects of social determinants of health.
- ▶ A common agent of infection can be responsible for widespread life-threatening infection with devastating consequences for the patient.
- ▶ Adequate evaluation and source control are vital to avoid such consequences and are often overlooked.

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