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Multi-system *Klebsiella sepsis*: A tale of destruction form lung to eye

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Abstract

Klebsiella pneumoniae, found in the gastrointestinal flora is a causative agent of hospital-acquired infections. Although isolated organ infections are common, reports of multi-system involvement are rare. We report on a susceptible patient presenting with disseminated *Klebsiella* infection with concurrent multi-organ disease involving the lung, liver, prostate and eye. He recovered after prolonged therapy but suffered from permanent sequalae. Early diagnosis and aggressive therapy is facilitated by awareness and a high degree of suspicion in at-risk patient groups.

Keywords

Klebsiella pneumonia, liver abscess, prostate abscess, endophthalmitis, case report

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Introduction

Klebsiella pneumoniae, a gramme-negative resident of the gastrointestinal flora is a causative agent of hospital-acquired infections. However, community-acquired systemic infections have also been described.[1] Diminished host defences seen in diabetes, malignancy and chronic obstructive pulmonary disease (COPD) predispose to *Klebsiella* infections.[2] Although isolated pulmonary, liver and genitourinary infections are described, reports of multi-system involvement have been reported.[3]

Case presentation

A 48-year-old male was investigated in a medical unit for fever and a productive cough of 2 weeks duration. He had diabetes and history of tuberculosis (TB) bronchiectasis. Initial investigations showed a neutrophil leucocytosis, an erythrocyte sedimentation rate (ESR) of 110 mm/first hour and a chest radiograph that revealed patchy consolidation in the right-upper zone and changes consistent with post-TB bronchiectasis and fibrosis. These findings were confirmed subsequently by high-resolution chest computed tomography (HRCT). Sputum samples were negative for acid fast bacilli, TB polymerase chain reaction (PCR) and pyogenic culture. However, a blood culture was positive for *K. pneumonia*, and he was started on intravenous cefotaxime based on the antibiotic sensitivity pattern.

He was subsequently investigated for non-specific abdominal pain with abdominal ultrasonography and a contrast-enhanced CT which showed bilobar hypo-dense liver lesions in the arterial phase that became iso-dense during venous phase. Furthermore, lesions enhancing in the arterial phase were also noted in the right lobe of prostate (Figure 1). Digital rectal examination of prostate did not reveal any significant abnormality, and his prostate-specific antigen (PSA) level was 3.2 ng/l. Upper and lower gastrointestinal endoscopy was normal and a liver biopsy or aspirate was planned. While awaiting this, he developed an acute unilateral painful red eye with rapidly worsening visual acuity. A diagnosis of acute endophthalmitis was made, and the vitreous aspirate was positive for *K. pneumoniae*.

A subsequent abdominal CT scan showed partial resolution of the liver lesions but enlargement of the prostatic lesion that

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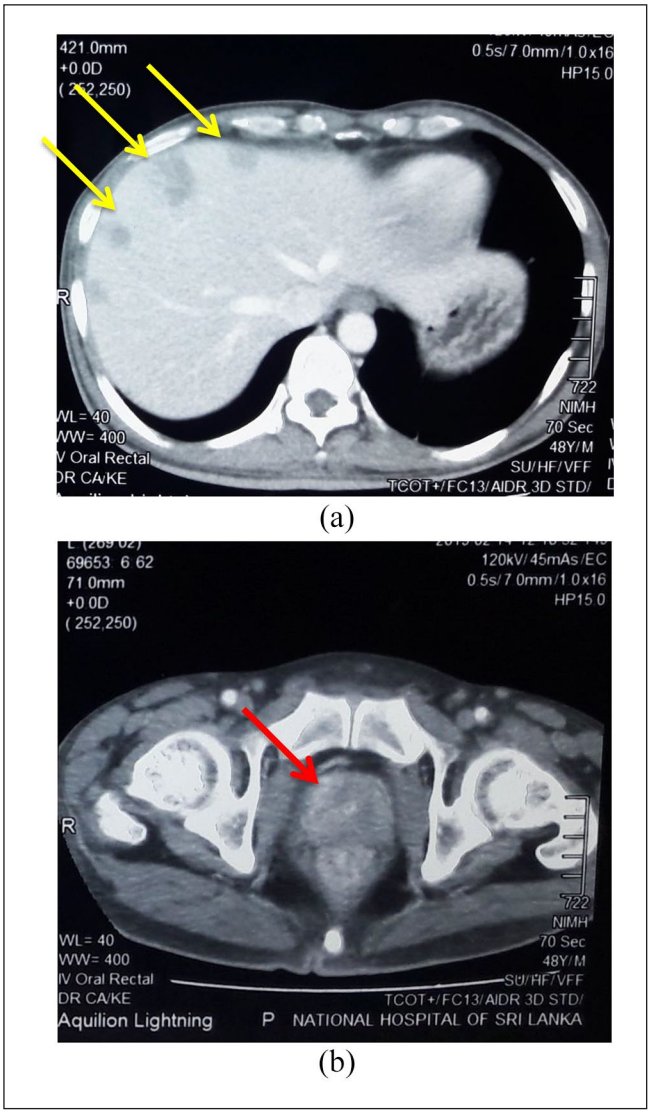

Figure 1. (a) Liver: yellow arrows indicate liver lesions and (b) prostate: red arrow indicates enhancement of right lobe of prostate gland.

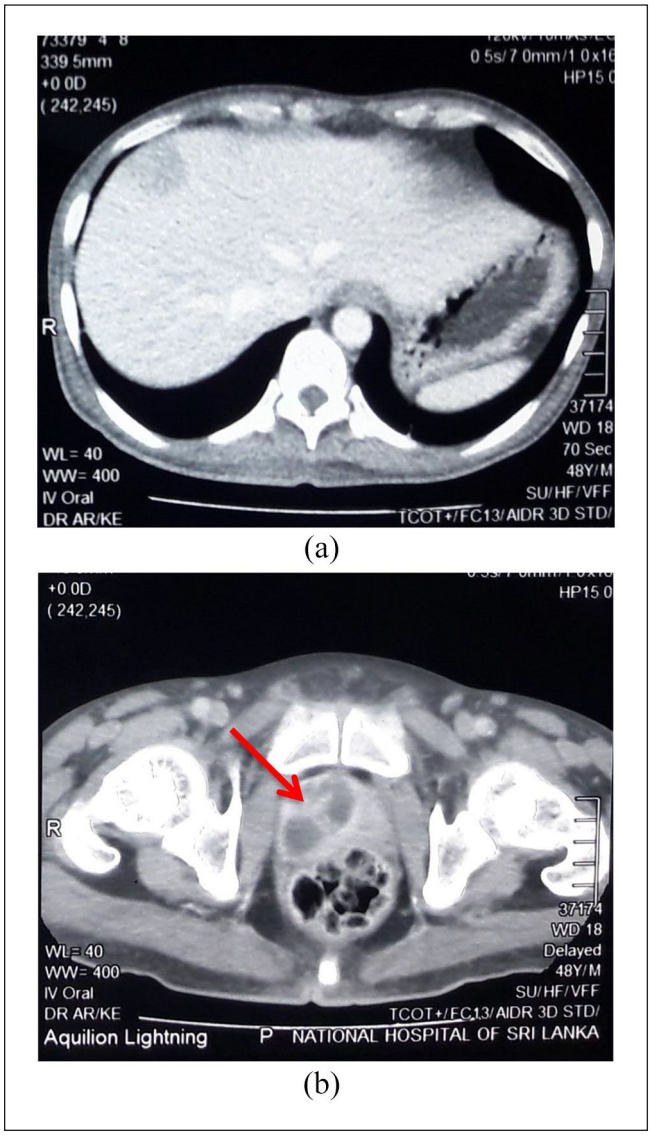

Figure 2. (a) Liver: resolution of previous lesions and (b) prostate: red arrow indicates abscess formation of right lobe of prostate gland.

now resembled a prostatic abscess (Figure 2). Following 14 days of intravenous ceftriaxone antibiotic therapy and intravitreal injection of antibiotics, clinical and ultrasonic resolution of the hepatic and prostatic abscesses was noted, in addition to the normalisation of his inflammatory markers. Unfortunately, the endophthalmitis resulted in permanent loss of vision in the left eye, and enucleation was not performed as patients wish. He was discharged after a hospital stay of one and half months and is under follow-up as an outpatient.

Discussion

K. pneumoniae is a constituent of the *Enterobacteriacae* of the gut flora. It is predominantly implicated in nosocomial infections, often in the background of impaired host immunity. Although less common, community-acquired infections such as 'invasive liver abscess syndrome' have been reported in otherwise well patients in East Asia[1] and morbidity and mortality are largely linked to host factors and microbial virulence.

Unsurprisingly, morbidity and mortality is higher in nosocomial *K. pneumoniae* infections.[4] Host immunity impaired due to diabetes, renal failure, immunosuppressive therapy and malignancy has been associated with clinical presentation and disease severity.[5] Secondary infection with extended spectrum beta lactamase (ESBL)-producing *K. pneumoniae* has been reported in patients with TB.[6]

Disseminated multi-system infections have been linked to virulence factors of *K. pneumoniae* such as formation of a protective exopolysaccharide web associated with mucoviscosity and

virulence of the K1 strain by expression of magA gene.[7] The K1 genotype has been associated with pyogenic liver abscess formation and endophthalmitis.[8] Even though the initial observations of geographical variability in the distribution of virulence factors were observed in countries such as Taiwan, at present, these strains are encountered worldwide.[9,10]

Metastatic infections such as meningitis, endophthalmitis and pulmonary empyema are features of *K. pneumoniae* invasive liver abscess syndrome.[11] Although simultaneous affliction of multiple systems[3] including the prostate and eye with the lung[12] and the liver[13] have been reported previously, this is the first report of concurrent pulmonary, hepatic, prostatic and ophthalmic infection. In a third of cases, metastatic infection is detected on admission and in others over an average period of 3 days.[14] Even though the outcome of endophthalmitis is poor, early identification and treatment with antibiotics, steroids and surgical treatment such as pars plana vitrectomy in selected patients may preserve the function.[15]

Treatment is organ dependent and may warrant radiological or surgical drainage in the presence of abscess formation. Antibiotics are guided by sensitivity patterns with third-generation cephalasporins used as first-line therapy[16,17] and carbapenems are reserved for ESBL producing organisms.

Owing to the underlying diabetes and exacerbations of TB bronchiectasis requiring hospitalisation, the reported patient was susceptible to disseminated *K. pneumoniae* infection. These factors point to the primary source of his infection most likely being the lungs. The non-availability of PCR for magA[1] in our institution precluded testing for virulent capsular antigens. Short-course antibiotic therapy of what was perceived to be a community-acquired lung infection and the failure to appreciate the risk status at the initial hospitalisation may have contributed to the subsequent exacerbation.

The central hypo attenuation with peripheral enhancement characteristic of liver abscesses was not observed in this patient's CT.[18] This atypical appearance with the presence of the prostatic lesion led to the suspicion of a metastatic malignancy at the onset.[19] However, clinical and haematological indicators of an infective presentation with simultaneous involvement of several organs points towards a metastatic infective aetiology.

Conclusion

We report on an aggressive presentation of disseminated *K. pneumoniae* involving the lung, liver, prostate and eye in a susceptible individual. Awareness coupled with a high index of suspicion in at-risk patients and aggressive and prolonged therapies are essential to minimise devastating sequelae.

Availability of data and material

All data generated or analysed during this study are included in this published article.

Authors' contributions

O.B., U.J. and K.W. contributed to collection of information and writing of the manuscript. SS contributed to writing and final approval of the manuscript. All authors read and approved the final version of the manuscript.

Declaration of conflicting interests

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Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed consent

Informed written consent for publication and accompanying images was obtained from the patient prior to collecting information.

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