



# Urgent nephrectomy for rapidly progressive disseminated metastatic Hypermucoid Klebsiella

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## ABSTRACT

Few cases of Hypervirulent Klebsiella Pneumonia (HvKP) have been described. Even fewer cases with renal abscess and metastatic pulmonary spread are reported. Typically, prompt introduction of intravenous antibiotics leads to clinical resolution and more invasive measures of source control are rarely required. To date only one other case of disseminated metastatic HvKP requiring nephrectomy for infective source control is described. Here we present a rare case of metastatic HvKP refractory to intravenous antimicrobial therapy in an immunocompromised newly diagnosed diabetic patient. Specifically, we seek to illustrate the rapid effectiveness of surgical intervention following a poor response to initial treatment.

## 1. Introduction

Hypervirulent *Klebsiella* is uncommon. Rarely has disseminated infection with renal involvement been described. We report such a case requiring urgent nephrectomy for source control. We seek to highlight the rapid effectiveness of surgical intervention following a poor response to initial conservative management.

## 2. The case

A 35 year old female presented to a regional hospital febrile and tachycardic. Serum glucose level was 20.5 mmol/L with a glycosylated hemoglobin level of 12.1%, suggestive of undiagnosed type 1 diabetes mellitus. Physical examination revealed marked right flank tenderness. Neutrophil count was  $30.39 \times 10^9/L$  and C reactive protein (CRP) elevated to 650 mg/L. Urine culture and microscopy isolated *Klebsiella pneumoniae* while renal function was normal. Computed tomography scan of her chest, abdomen and pelvis (CT CAP) with contrast displayed right pyelonephritis and two right renal abscesses. The first (Fig. 1, A) an inferolateral collection measuring 42mm  $\times$  17.1mm and 48mm  $\times$  13.2mm. The second (Fig. 1, B), a curvilinear medial collection measuring 92.5mm  $\times$  16.4mm and 45.1mm  $\times$  14.4mm. On Chest X-ray

(CXR), the left lung base displayed a focus of low attenuation with surrounding inflammatory change concerning for pulmonary abscess.

The patient was commenced on intravenous (IV) antibiotics and admitted hospital. Blood cultures returned positive for *Klebsiella pneumoniae* resistant to ampicillin. Disseminated metastatic intravascular hypervirulent *klebsiella* bacteremia was diagnosed. Despite targeted IV antimicrobial therapy and insulin to control serum glucose level, systemic signs of infection and elevated biochemical infective markers remained refractory to conservative therapy. Serial imaging with CT CAP four days following admission revealed new areas of liquefactive necrosis within the right renal parenchyma. Imaging also noted an increase in size of both renal abscesses. The inferolateral collection (Fig. 2, A) now measured 59mm  $\times$  22mm (previous 42mm  $\times$  17.1mm) and 61.8mm  $\times$  24.7mm (previous 48mm  $\times$  13.2mm). The second curvilinear medial collection (Fig. 2, B) measured 103.8mm  $\times$  17.6mm (previous 92.5mm  $\times$  16.4mm) and 49mm  $\times$  17.1mm (previous 45.1mm  $\times$  14.4mm). Chest imaging displayed a well circumscribed pulmonary abscess within the right lower lobe measuring 29.3mm  $\times$  19.3mm (Fig. 3). New bilateral pleural effusions were noted adjacent to the extending left lower lobe inflammatory change. Deterioration in the patient's inflammatory markers and radiological evidence of infective progression associated with possible renal infarction resulted in prompt

**Abbreviations:** Hypervirulent *Klebsiella* Pneumonia, HvKP; C reactive protein, CRP; Chest X-ray, CXR; Intravenous, IV; Computed tomography scan of chest, abdomen and pelvis, CT CAP; Classic strains of *Klebsiella pneumoniae*, cKP.

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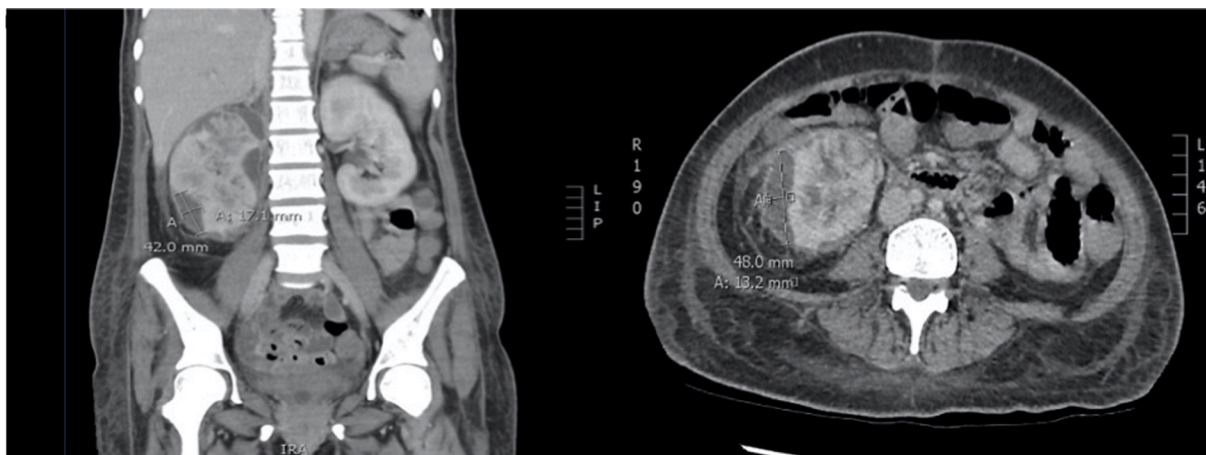
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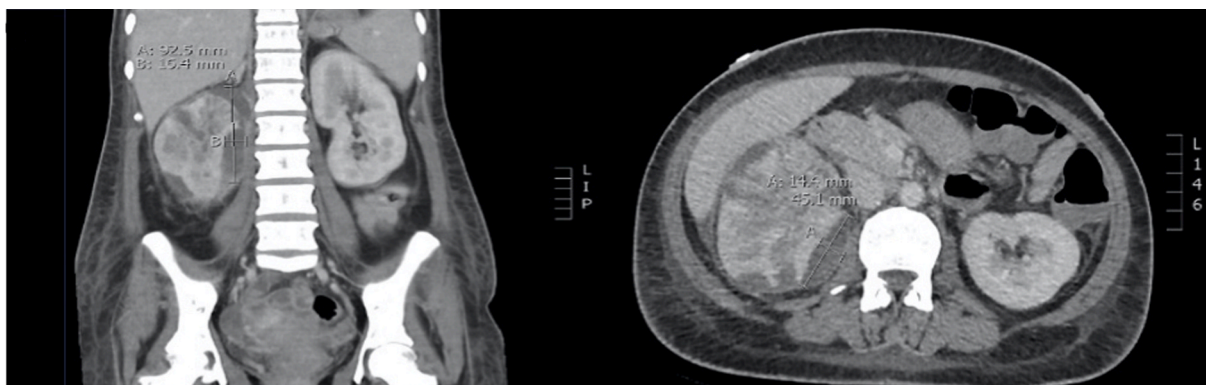
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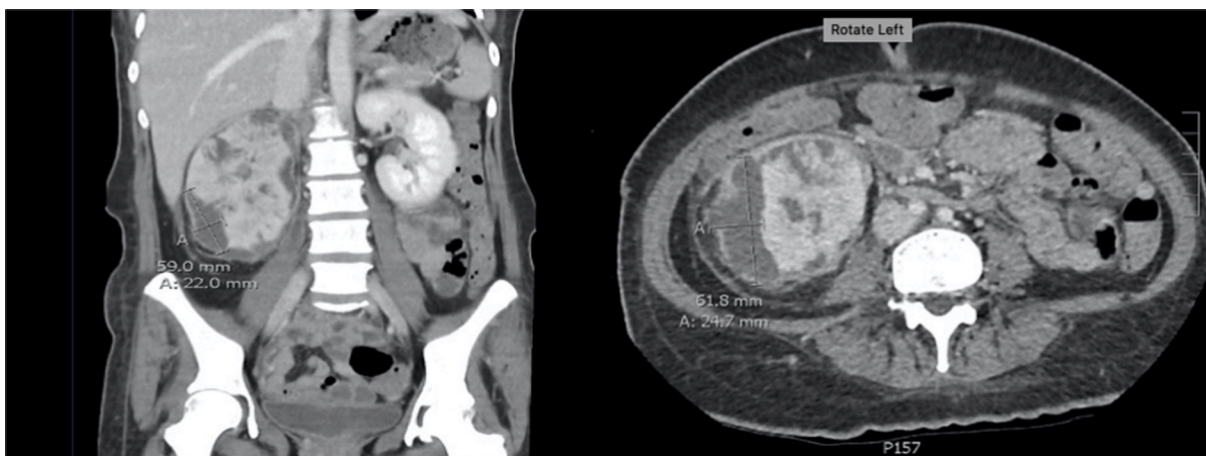
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**Fig. 1A.** Inferolateral collection (CT with IV contrast in portal venous phase)  
 Coronal image displaying an 42mm × 17.1mm inferolateral collection  
 Axial plane showing 48mm × 13.2mm inferolateral collection in the axial plane.



**Fig. 1B.** Medial collection (CT with IV contrast in portal venous phase)  
 Coronal image displaying an 92.5mm × 16.4mm medial collection.  
 Axial plane showing medial collection measuring 45.1mm × 14.4mm.

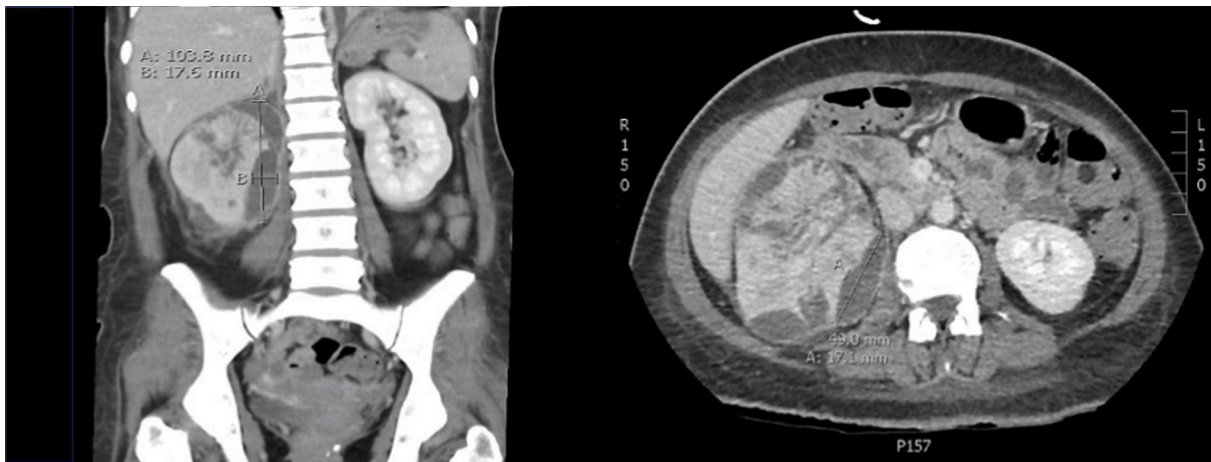


**Fig. 2A.** Inferolateral collection (CT with IV contrast in portal venous phase)  
 Coronal image of inferolateral collection measuring 59mm × 22mm (previous 42mm × 17.1mm)  
 Axial plane showing inferolateral collection measuring 61.8mm × 24.7mm (previous 48mm × 13.2mm).

referral to our center.

Urological assessment in conjunction with infectious disease input deemed right open nephrectomy necessary in order to prevent further progression of the disease. Significant inflammatory changes were noted

at the time of surgery. Copious retroperitoneal washout was performed. Post operative recovery was rapid and she was transferred to the ward within two days. Infective markers declined rapidly with CRP reaching 19 mg/L and white cell count  $<10 \times 10^9$  cells/L within four days. Due to



**Fig. 2B.** Medial Collection (CT with IV contrast in portal venous phase)

Coronal image of medial collection measuring 103.8mm × 17.6mm (previous 92.5mm × 16.4mm).

Axial plane showing medial collection measuring 49mm × 17.1mm (previous 45.1mm × 14.4mm).



**Fig. 3.** CT chest with IV contrast

Well circumscribed pulmonary abscess within the right lower lobe measuring 29.3mm × 19.3mm. Note surrounding inflammatory change with adjacent bilateral pleural effusions.

investigation for alternative sites of metastatic infective foci (discharge was delayed to two weeks. A one month course of ciprofloxacin was prescribed on discharge with infectious disease and urology follow up organised.

At six weeks follow up repeat CXR displayed resolution of pulmonary abscess. Renal function remained stable and white cells normal. The patient had returned to fulltime work and was well.

### 3. Discussion

This report describes a rare case of disseminated metastatic hypervirulent (hypermucooid) *Klebsiella* (HvKP) refractory to conservative management. Similar cases with multiorgan involvement are rare. To date only one case requiring nephrectomy for infective source control is described.<sup>1</sup> In our case, percutaneous drainage of the renal abscesses at first presentation was considered however the initial regional hospital did not have access to this service. Given extensive radiographic evidence of renal parenchymal necrosis and the disseminated and rapidly progressive nature of the drug resistant hypervirulent *klebsiella* infection the patient was transferred to our tertiary center for nephrectomy to achieve rapid infective source control and preservation of viable.

Hypervirulent *Klebsiella* is uncommon. First described in the late 20th century within the Asian Pacific Rim the bacterium is known to infect both healthy and immunocompromised hosts across the globe.<sup>2</sup> When compared to classic strains of *Klebsiella pneumoniae* (cKP) HvKP has an increased propensity to cause serious infection in healthy hosts and to invade multiple organs and become disseminated.<sup>2</sup> Spontaneous abscesses within the liver are most common with metastases to the brain and eyes resulting in meningitis and endophthalmitis.<sup>3</sup>

Management generally includes antimicrobial therapy however multi-drug resistance is evolving rapidly. With developing resistance HvKP infection will become increasingly difficult to treat and associated morbidity and mortality will increase.<sup>2</sup>

Currently only three cases of multiorgan HvKP with renal involvement are reported within the literature.<sup>3,4,5</sup> In two of these cases the patients were successfully treated with IV antibiotics.<sup>4,5</sup> However one case required nephrectomy for infective source control.<sup>1</sup> Whilst similar to the case described the presence of an obstructive renal stone complicates the presentation and an obvious source of infection was present. With an uncomplicated urinary tract the patient described in our case highlights the aggressive nature of HvKP infection in a vulnerable patient and its ability to readily disseminate.

### 4. Conclusion

Hypermucoviscous *Klebsiella pneumoniae* is a rare infection. Clinical deterioration despite aggressive intravenous antimicrobial infection can occur and it is vital to obtain immediate source control, especially in an unsuspecting immunocompromised patient as outlined in this study. In the case described, prompt recognition of the patients with failure to improve despite specific IV antimicrobial therapy along with radiographic evidence of infective progression led to appropriate action. Metastatic HvKP may be a harbinger of underlying immunocompromisation or antimicrobial resistance, making conservative management challenging.

### Disclosures

Written informed consent was obtained from the patient's family for publication of this case report and the accompanying images.

### Approval of the research protocol by an institutional reviewer board

N/A.

**Registry and the registration no. of the study/trial**

N/A.

**Declaration of competing interest**

The authors declare no conflict of interest.

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