Urgent nephrectomy for rapidly progressive disseminated metastatic Hypermucoid Klebsiella

Thomas Neerhut a,*, John Ninan a, Jack Crozier b, Malcolm Lawson b, Handoo Rhee b,c

a Princess Alexandra Hospital, Brisbane, 199 Ipswich Road, Woolloongabba, 4102, Australia
b Princess Alexandra Hospital, Brisbane, Australia
c University of Queensland, Australia

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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. Hemoglobin level was 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 pneumonia 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.

* Corresponding author. 199 Ipswich Road, Woolloongabba, 4102, Australia.
E-mail address: Thomas.Neerhut@health.qld.gov.au (T. Neerhut).

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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

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**Fig. 1A.** Inferolateral collection (CT with IV contrast in portal venous phase)
Coronal image displaying an 42mm $\times$ 17.1mm inferolateral collection
Axial plane showing 48mm $\times$ 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 $\times$ 16.4mm medial collection.
Axial plane showing medial collection measuring 45.1mm $\times$ 14.4mm.

**Fig. 2A.** Inferolateral collection (CT with IV contrast in portal venous phase)
Coronal image of inferolateral collection measuring 59mm $\times$ 22mm (previous 42mm $\times$ 17.1mm)
Axial plane showing inferolateral collection measuring 61.8mm $\times$ 24.7mm (previous 48mm $\times$ 13.2mm).
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 full time work and was well.

3. Discussion

This report describes a rare case of disseminated metastatic hypervirulent (hypermucoid) 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.1 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.2 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.1 Spontaneous abscesses within the liver are most common with metastases to the brain and eyes resulting in meningitis and endophthalmitis.

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.2 Currently only three cases of multiorgan HvKP with renal involvement are reported within the literature.1,4,5 In two of these cases the patients were successfully treated with IV antibiotics.4,5 However one case required nephrectomy for infective source control.1 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 immunocompromise 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.

References

1. Stotka JL, Rupp ME. Klebsiella pneumoniae urinary tract infection complicated by endophthalmitis, perinephric abscess, and ecthyma gangrenosum. South Med J. 1991;84:790-793.

2. Shon AS, Bajwa RP, Russo TA. Hypervirulent (hypermucoviscous) Klebsiella pneumoniae: a new and dangerous breed. Virulence. 2013;4:107-118.

3. Catalán-Nájera JC, Garza-Ramos U, Barrios-Camacho H. Hypervirulence and hypermucoviscidity: two different but complementary Klebsiella spp. phenotypes. Virulence. 2017;8:1111-1121.

4. Suzuki K, Yamaguchi T, Yanai M. Simultaneous occurrence of hypermucoviscous Klebsiella pneumoniae emphysematous prostatic abscess, emphysematous cystitis, and renal abscess. IDCases. 2018;14, e00464.

5. Hassanin F, Khawjah D, Elkhamey S, et al. Renal abscesses and endogenous endophthalmitis due to hypermucoviscous hypervirulent Klebsiella pneumoniae (HVKP). IDCases. 2021;24, e01130.