

Inflammation and infection

Emphysematous pyelonephritis and septic shock in an elderly male patient caused by extended-spectrum beta-lactamase producing *Klebsiella pneumoniae*

Abdulmalik Altayib^a, Badr Badr^b, Abdullah Basnawi^c, Abdalla Khalil^{d,*}, Saleh Binsalman^e

^a Section Head of Urology Department, IMC Hospital Jeddah, 2172, Saudi Arabia

^b Medical Imaging Department, IMC Hospital Jeddah, 2172, Saudi Arabia

^c Emergency Medicine, IMC Hospital Jeddah, 2172, Saudi Arabia

^d Internal Medicine, Emergency Department, Jeddah, 2172, Saudi Arabia

^e Senior Specialist, Urology Department, IMC Hospital Jeddah, 2172, Saudi Arabia



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ABSTRACT

Emphysematous Pyelonephritis is a rare necrotizing infection with gas production and a high overall mortality rate.

An elderly diabetic male patient presented to our Emergency Department with septic shock and was found to have left perinephric emphysematous pyelonephritis with a large collection. He was managed with the proper antibiotic therapy, and two trials of percutaneous drainage of the collection with no significant reduction in the size of the abscess. After operative drainage and debridement of multiple pockets, he improved and was discharged home. Extender spectrum beta-lactamase producing organism was an additional challenge in our patient's management.

Introduction

Emphysematous pyelonephritis EPN is a rare severe necrotizing infection associated with gas production.

Diabetes Mellitus and urinary tract obstruction are the major risk factors for EPN and overall mortality is 19%.

The most common isolated organisms in EPN are the enteric gram-negative facultative anaerobes.

Proper antibiotic therapy and percutaneous drainage PCD are usually sufficient modalities of management for renal and perinephric abscess.

Surgical drainage is rarely required.

Case report

A 79-year-old male came to Emergency Department ED with main complaint of fever, abdominal pain, and dysuria for 3 days. He was known to have Diabetes Mellitus type 2, essential hypertension, and benign prostatic hypertrophy. He was treated with IV antibiotics in

another hospital for a urinary tract infection and discharged 5 days ago without a medical report. He looked sick, his pulse was 118/min, BP was 82/46 mm hg, temperature was 38.3C, and his capillary blood sugar was 11.7 mmol/L.

He had a tender left lumbar and left iliac fossa. The rest of the physical exam was unremarkable. He received a bolus of 1.5 L of 0.9% sodium chloride IV and meropenem 1 gm after urine and blood culture.

The patient's abnormal blood tests results have shown in [Table 1](#).

Urinalysis revealed WBC 20/HPF and positive nitrates.

The rest of the blood tests results were normal, and ECG showed sinus tachycardia.

The CT abdomen and pelvis without contrast revealed a large left renal and perirenal abscess with an air-fluid level. [Fig. 1A](#) and [1B](#)

The gas was tracking between fascia transversalis and the oblique muscle of the anterolateral abdominal wall ([Fig. 2A](#)).

In ICU, the patient received more IV fluids, meropenem, and norepinephrine titrated infusion. A percutaneous drain was inserted US-guided on the fourth day after admission. Urine culture grew ESBL producing *Klebsiella pneumoniae* which was sensitive to gentamycin,

* Corresponding author.

E-mail addresses: Atayib@imc.med.sa (A. Altayib), Bbadr@imc.med.sa (B. Badr), dr.basnawi@gmail.com (A. Basnawi), abdallak59@gmail.com (A. Khalil), Sbinsalman@imc.med.sa (S. Binsalman).

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Table 1
Main blood test results during the patient's septic shock in the Emergency Department and after admission.

	White Blood Cells count	Neutrophils count	Blood urea Nitrogen	Serum creatinine	C Reactive protein	Lactic Acid
In Emergency Department	27.96 10^3 cell/mm ³ (4–11.000)	25.75 10^3 cell/mm ³	40 mg/dl (7–21 mg/dl)	1.49 mg/dl (0.6–1.2 mg/dl)	388 mg/l (0–5 mg/l)	4.1 mmol/l (0.5–2 mmol/l).
After 2 trials of percutaneous drainage	WBC was 16.31 10^3 cell/mm ³	11.610 10^3 cell/mm ³	20 mg/dl	1.1 mg/dl	190 mg/l	2.0 mmol/l
After surgical drainage	7.10 10^3 cell/mm ³	4.50 10^3 cell/mm ³	17 mg/dl	1.0 mg/dl	78 mg/dl	1.0 Mmol/l

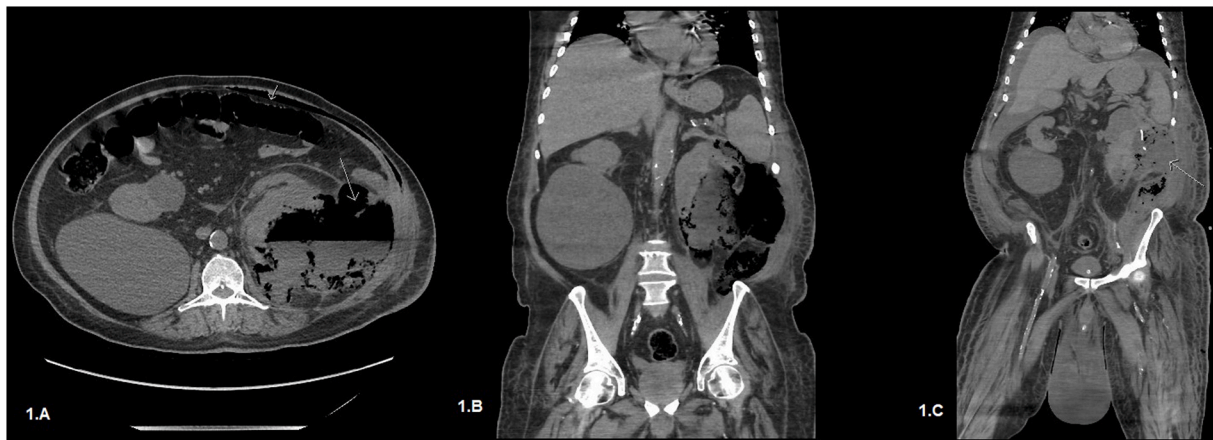


Fig. 1. CT Abdomen and pelvis without contrast Fig. 1A and Fig. 1B showed a large left renal and perirenal abscesses with air fluid level (white arrow axial view Fig. 1A), and a large cyst was noted inferioposterior to the right kidney e Fig. 1C) showed no significant reduction in the size of the perinephric abscess and a tip of the drain was noted in the collection (white arrow coronal view Fig. 1C).



Fig. 2. CT Abdomen and pelvis without contrast (coronal view Fig. 2A) showed gas tracking between fascia transversalis and oblique muscle of the anterior abdominal wall (white arrow).

CT Abdomen and pelvis with IV contrast after the surgical drainage (axial view Fig. 2B) and (coronal view Fig. 2C) showed interval resolution of the perinephric collection and gas with the persistence of the inflammatory changes of the left side of the anterior abdominal wall muscles.

meropenem, and nitrofurantoin (was resistant to the rest of tested antibiotics). The patient's blood pressure improved and noradrenaline infusion stopped on the third day.

Fluids from the drain grew the same ESBL *K.pneumoniae* with the same sensitivity pattern of urine.

On the 8th day, drained fluid stopped (total drained 460ml). Two new drains inserted CT guided. On the 10th day, fluid stopped again

(total volume 1120ml).

The Patient felt slightly better, his maximum temperature was 37.8C, and his main blood tests results are displayed in Table 1.

On the 13th day, CT scan abdomen without contrast revealed no significant reduction in the size of the left perinephric and renal collection, and tip of the drain was noted in the collection. Fig. 1C

Diuretic scintigraphy study showed total GFR 63ml/min, left kidney

was contributing to 46% and right 54%.

The need for surgical drainage of the collection after the failure of 2 trials of the PCD was explained to the patient and next of kin and they accepted the decision.

On the 16th day after admission, the patient was transferred to the operating theater for the surgical drainage of the perinephric abscess and abdominal collection.

He was placed in a lateral decubitus, a flank incision was made at the level of 12th rib. The retroperitoneum was entered. Multiple pockets of pus and necrotic tissues were encountered extending down to lower abdomen which were drained and debrided. The kidney was left intact.

Methylene blue was injected intravenously to ensure the integrity of the ureter. Three drains were inserted, and the wound was closed primarily.

He felt better gradually, was afebrile, and his blood tests improved significantly [Table 1](#).

Meropenem IV was replaced by ertapenem IV once daily and surgical drains were removed on the 7th day after surgery.

He was discharged on the 10th day after surgery and finished a course of 5 weeks of IV (meropenem/ertapenem).

Repeated CT abdomen and pelvis with IV contrast axial and coronal view (3 weeks after discharge) revealed resolution of the perinephric collection and gas. [Fig. 2B](#) and [2C](#)

Discussion

CT scan has been known as the gold standard for the diagnosis of EPN, and Huang and Tseng's classification is the most commonly used tool for the staging of EPN.¹

Poor prognostic factors with higher mortality of EPN are thrombocytopenia, altered level of consciousness, acute renal failure, and shock.²

Our patient presented with shock and his serum creatinine normalized after resuscitation with fluid and the proper antibiotic. According to Huang and Tseng classification, he was classified stage 3 B (gas extending beyond the Gerota fascia) and he had 2 trials of percutaneous drainage of the collection with no size reduction.

The PCD modality of intervention for perinephric abscesses in 86 patients was not found to be the optimal modality for multilocular perinephric abscesses and open surgical drainage provided a higher cure rate and shorter hospital stay than PCD.³

In the operating theatre, our surgeons found multiple pockets of pus and debris in the perinephric and abdominal collection. These multiple pockets and debris explained the failure of the 2 PCD trials and the good outcome after surgical drainage and debridement which is supported by the previous study.³

ESBL producing organism was another challenge in our patient with

EPN.

ESBL related infections have a higher mortality rate and longer hospitalization than non-ESBL infection.⁴ Early recognition of ESBL infections and initiation of the proper antibiotic therapy improves the outcome of patients.⁴

The incidence of ESBL producing E.coli isolated from urinary tract infections was 23.1% in the Eastern province of Saudi Arabia.⁵

ESBL producing organism was highly suspicious in our shocked patient, based on previous hospitalization, IV antibiotic, and Meropenem IV was started after septic screen.

Conclusion

Early recognition and proper antibiotic therapy improve the outcome of EPN. Operative drainage may be required in multilocular perinephric abscesses.

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Declaration of competing interest

No conflict of interest.

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