

First report of concurrent mixed germs induced destructive emphysematous pyelonephritis and emphysematous endophthalmitis in the patient with COVID-19

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ABSTRACT

A 35-year-old diabetic woman was referred to the emergency department with fever, left flank pain, pneumaturia, and impaired vision of the left eye from 4 days ago. Fever, tachycardia, tachypnea, low blood pressure, metabolic acidosis, and azotemia were the first findings. The diagnosis was a coincidence of emphysematous pyelonephritis and emphysematous endophthalmitis due to computerized tomography of the patient. Immediate fluid and electrolytes resuscitation, intravenous antibiotic administration, and nephrectomy save the patient. Urine, blood, and vitreous cultures revealed mixed germ infection.

1. Introduction

Kelly and MacCallum characterized a case of gas-forming destructive infection of renal parenchyma, collecting ducts with fever and pneumaturia in 1898 but Schultz and Klorfein used the term Emphysematous Pyelonephritis (EPN) in 1962 for the first time.¹

EPN is an acute, progressive, mortal, necrotizing infection of the renal parenchyma and pyelocaliceal system which can spread to adjacent tissues. EPN is commonly seen in patients with poorly controlled diabetes mellitus, debilitated immune-deficient patients with urinary tract obstruction, and infection with a wide spectrum of microbial agents.^{1,2}

In all series, *Escherichia coli* is the most common infectious organism, followed by *Klebsiella*, *Proteus*, *Pseudomonas*, *Clostridium*, *Streptococcus*, *Candida*, *Aspergillus* and *Cryptococcus* species and sometimes polymicrobial infections. Hallmark sign is mottled gas (carbon dioxide) in the renal parenchyma and pyelocaliceal system, which is generated by bacterial fermentation of glucose and acids.¹

EPN is more seen in female patients and is rare in children. The most common symptom is fever followed by flank pain, nausea, and vomiting. The existence of gas in the kidney, ureter, and bladder in X-ray, intravenous pyelography and computerized tomography scan (CT scan) is diagnostic. CT scan is the imaging procedure of choice in demonstrating

the extent of the emphysematous process and planning management.²

There are some different classifications based on imaging. The most commonly used classification was defined by Huang and Tseng based on CT scan:

Class I: Gas in collecting system only.

Class II: Parenchymal gas only.

Class IIIa: extension of gas into perinephric space.

Class IIIb: extension of gas into pararenal space.

Class IV: EPN in a solitary kidney, or bilateral disease²

Some findings are more correlated with higher mortality rate and poor outcomes like older age, higher body mass index (BMI), past history of steroid use, presence of septic shock sign and symptoms in the initial assessment, high hemoglobin A1C, positive blood culture, extensive class in CT scan.^{1,3}

The best management is immediate resuscitation consists of fluid and electrolytes management, serum glucose control, wide spectrum antibiotic coverage, and then percutaneous drainage or nephrectomy due to the general condition of the patient.^{2,3}

2. Case report

A thirty-five-year-old woman was referred to the emergency department with complaints of fever, shaking chills, flank pain, nausea,

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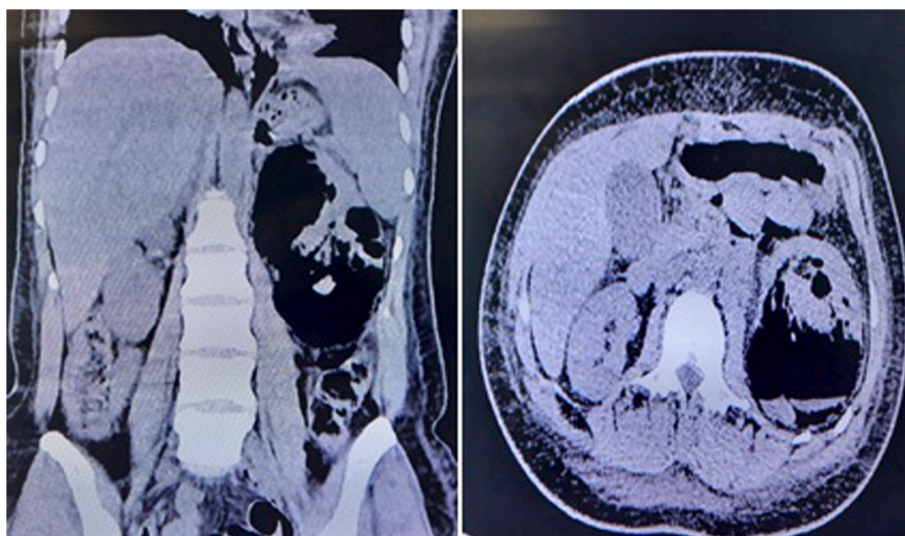


Fig. 1. Abdominopelvic CT scan (Class IIIb emphysematous pyelonephritis).

Table 1

The first data of patient in emergency room before surgical management and data of this patient 6 h after nephrectomy.

	Before nephrectomy	6 h after nephrectomy
General condition	Poor	Good
Body temperature	39°c	37.8°c
Pulse rate	125	90
Systolic Blood pressure	70 mmHg	11 mmHg
Respiratory rate	24	18
WBC count	28 × 10 ³ /mm	21 × 10 ³ /mm
Neutrophils	96%	92%
Hemoglobin	7 g/dL	9 g/dL
BS	400 mg/dL	240 mg/dL
Creatinine	6.1 mg/dL	5.4 mg/dL
Na	136 mmol/L	135 mmol/L
K	6.5 mmol/L	5.7 mmol/L
Arterial PH	7.1	7.31
Hco3	16 mmol/L	22 mmol/L

and vomiting. She is a poorly controlled type I diabetics Mellitus patient with multiple end-organ damages like nephropathy, retinopathy, and osteomyelitis. She has been treated because of fever, back pain, and positive COVID-19 PCR test from seven days ago, but the process deteriorated from four days ago and urinary frequency, pneumaturia, impaired vision, and purulent discharge of the left eye were added to the complex.

In the abdominopelvic CT scan, severe emphysema in the left large kidney with extension to retroperitoneal space adjacent to the left ureter and psoas muscle and lower mediastinum space (Class IIIb) with excessive destruction of left renal parenchyma were noted (Fig. 1).

After fluid resuscitation, wide-spectrum antibiotic, and packed cell administration, immediate nephrectomy was performed. A dramatic response was seen during the first 6 h after surgery and all contexts charted in Table 1.

A Head and orbit CT scan was done and emphysematous endophthalmitis (gas in the eye globe) was evident (Fig. 2). Ophthalmological consultation was performed and diagnostic and therapeutic vitrectomy was done. Vitreous humor gel that fills the eye cavity is removed and ciprofloxacin was injected.

The result of the vitreous aspirated specimen and kidney tissue culture were the same (*Klebsiella Pneumonia*) but interestingly urine and blood culture revealed different bacteria (*staphylococcus saprophyticus*), both sensitive to Imipenem. Therefore, the patient was treated with imipenem. The patient was discharged after two weeks with good

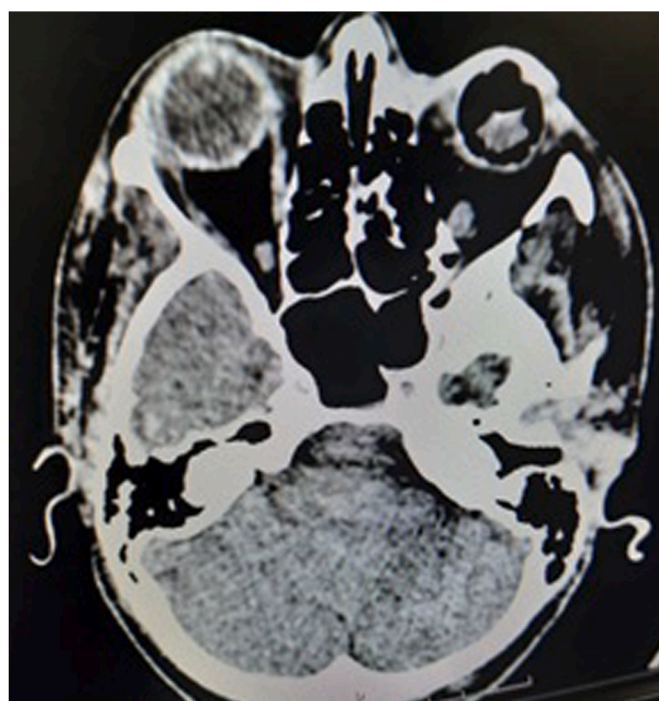


Fig. 2. CT scan of orbit revealed presence of gas in left globe.

condition and serum creatinine 2.1 mg/dL.

3. Discussion

The coincidence of emphysematous pyelonephritis and emphysematous endophthalmitis is a rare event and is more common in poorly controlled diabetic or immune-compromised patients due to bacteremia of urinary tract induced infection. Sometimes especially in patients with the good general condition and a little gas in pyelocaliceal system without cortical destruction may save the kidney with external drainage and medication, but in ill and high-risk patients nephrectomy should be considered.^{4,5}

The memorable factor, in this case, was two different bacteria in four different cultures and an incredibly rapid good response to immediate aggressive management despite multiple underlying diseases.

Destructive emphysematous pyelonephritis lonely has a high mortality rate in diabetic patients. Certainly, in presence of some other morbidities such as COVID-19 infection, the condition will be more dangerous and immediate definitive management is needed to save the patient.

Ethics

Patient informed consent was obtained to publish his information. The patient's private information remained confidential with the researchers.

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Section headings

Inflammation and Infection.

Roles

Anahita Ansari Djafari: Conceptualization, Methodology, Software.

Seyyed Ali Hojjati: Writing- Original draft preparation, Visualization, Investigation.

Hossein Rahnama: Supervision, Software, Validation.

Amirhossein Eslami: Writing- Reviewing and Editing.

Ayoub Salehi: Data curation.

Declaration of competing interest

The authors report no conflicts of interest in this work.

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