



Management of emphysematous pyelonephritis with antibiotic therapy and double J catheter placement: Case report.

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Abstract

Introduction: Emphysematous pyelonephritis is not a common infection, but it has a high mortality rate. Empirical antibiotic treatment is the first line of treatment; however, placing a double J catheter can be a viable resource for drainage of pus and gas from the renal parenchyma.

Case report: A 51-year-old woman with type 2 diabetes. He was admitted for seven days with dysuria, a fever of 39°C, and a capillary blood glucose level of 450 mg/dl. There was arterial hypotension (85/50 mmHg), tachycardia, and hypoxemia.

Diagnostic workshop: The studies reported azotemia, decompensated metabolic acidosis, leukocytosis of 47,400 u/μl, neutrophils of 85%, platelets of 30,000 u/μl, and Hb of 9 g/dl. On computed tomography of the abdomen, emphysema dilates the left renal pelvis, with gas that spreads through the ureter to the bladder.

Evolution: The patient was transferred to intensive care units due to hemodynamic instability, renal failure, tachyarrhythmia, resistant metabolic acidosis, and the need for hemodialysis. A double J catheter was placed, and 380 ml of purulent urine was drained and cultured with *Klebsiella*. Pneumoniae is sensitive to ceftazidime + avibactam. After the intervention, there was a progressive improvement.

Conclusions: We report a clinical surgical case that expanded our vision of managing emphysematous pyelonephritis. The use of the double-J device in the initial management, plus antibiotic therapy, allowed the patient to recover from septic shock.

Keywords:

Emphysematous pyelonephritis, Type 2 diabetes, Double J catheter, Case report.

Abbreviations

SGLT2: Sodium glucose cotransporter type 2 inhibitors.
CT: Computed axial tomography.

Supplementary information

No supplementary materials are declared.

Acknowledgments

Does not apply.

Author contributions

Victor Tenesaca Martinez: Conceptualization, data curation, Fund acquisition, Project administration, Supervision.
Elizabeth Mosquera Ortega: Conceptualization, formal analysis, methodology.
Eduardo Delgado Mora: Conceptualization, data curation, formal analysis, funding acquisition, research, writing - original draft.
All the authors have read and approved the final version of the manuscript.

Financing

The authors of this article financed the expenses of this research. The costs of studies, antibiotics, and procedures were part of the usual activities of internal medicine services, so they did not constitute additional costs to the patient.

Availability of data and materials

The data sets used and analyzed during the present study are available from the corresponding author upon reasonable request.

Introduction

Emphysematous pyelonephritis is not a common infection; however, it has a high mortality rate [1]. Kelly and MacCullum described 1898 as a “kidney infection with gas formation.” Years later, in 1962, Schultz and Klorfein used the term emphysematous pyelonephritis for the first time [2].

Emphysematous pyelonephritis begins as isolated pyelonephritis, an infection of the kidney parenchyma. Due to its contamination, it occurs in ascending, hematic, and lymphatic forms. The most common form is the ascending route, characterized by bacterial contamination from the urinary meatus to the bladder, presenting dysuria, frequency, and pain in the hypogastrium. Infrequently, men with urinary tract infections mention pain in the perineum region [3]. When the kidney is compromised in a diabetic patient, mortality increases, even more so if there is a perinephric abscess, and mortality triples if the bacteria are gas producers. The presence of infectious risk factors such as obesity, hyperglycemia, obstructive uropathies, and poor hygiene should be considered when patients are treated with sodium and glucose cotransporter 2 (SGLT2) inhibitors. In that case, we will have patients with recurrent urinary tract infections [4]. Empirical antibiotic treatment is the first-line treatment. However, placing a double J catheter can be a viable resource for the drainage of pus and gas in the renal parenchyma [5]. Clinical cases involving management accompanied by a double J catheter have been described.

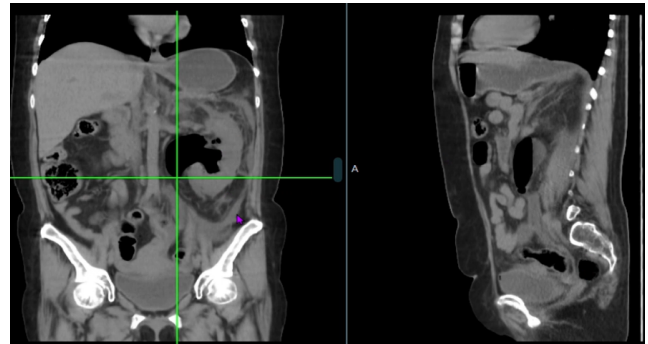
Clinical case

This is a 51-year-old woman with type 2 diabetes for five years and poor adherence to treatment. He was admitted as an emergency, with a clinical picture of 7 days of evolution, which began with dysuria, fever of 39°C, and capillary blood glucose of 450 mg/dl. Twenty-four hours ago, they had been drowsy, and 12 hours later, they noticed poor ventilatory mechanics and decided to seek medical assistance.

Physical exam

On admission, he had persistent arterial hypotension (85/50 mmHg), a heart rate of 130 beats/minute, an oxygen saturation of 85% without oxygen support, a respiratory rate of 25/minute, and a Glasgow scale of 13/15.

Figure 1. Computed tomography of the abdomen.



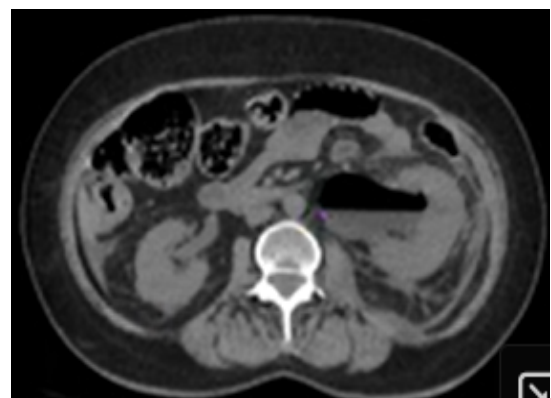
CT (computed tomography) of the abdomen and pelvis. The coronal section (left) shows gas, which dilates the left renal pelvis. In court, sagittal (right) dilation of the ureter is evident.

Figure 2. Computed tomography of the abdomen.



CT of the abdomen and pelvis, coronal section, and gas in the bladder are evident.

Figure 3. CT scan of the abdomen



CT of the abdomen/pelvis in the axial section. Mixed gas and pus were observed, which dilated the left renal pelvis.

Diagnostic workshop

In the first test reports, arterial blood gas analysis revealed decompensated metabolic acidosis. In the rest of the laboratory tests, the leukocyte count was 47,400 U/ μ l, the neutrophil count was 85%, the platelet count was 30,000 U/ μ l, and the Hb concentration was 9 g./dl, Hct was 29%, and nitrogen levels were elevated.

Driving

In the presence of septic shock due to infection in the urinary tract, blood pressure is improved with vasoactive agents (norepinephrine), and it is decided to protect the airway with invasive ventilatory support. Multiple cultures were taken. Empirical antibiotic therapy was started with piperacillin/tazobactam, clindamycin, and meropenem. A CT scan of the abdomen and pelvis was performed, where emphysema was observed dilating the left renal pelvis, with the presence of gas spreading through the ureter to the bladder (Figure 1, 2, 3).

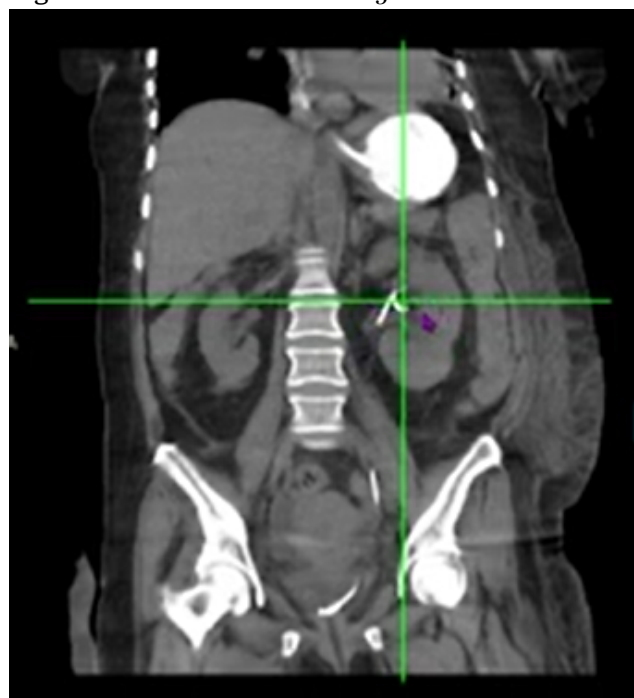
The patient was transferred to the intensive care area. In the first 24 hours, she maintained hemodynamic instability, presenting an episode of paroxysmal tachyarrhythmia, for which electrical cardioversion was performed, and subsequent management was performed with amiodarone, recovering sinus heart rhythm. The patient resisted metabolic acidosis without a bicarbonate response, so hemodialysis was performed, which partially corrected the acidosis. Due to the instability, the urology service was consulted to place a double J catheter. The procedure was performed, and 380 ml of purulent-looking fluid was obtained and cultured. The urine culture results revealed the presence of *Klebsiella pneumoniae* (a suspected carbapenemase), which is sensitive only to ceftazidime + avivactam (Table 1). Targeted antibiotic treatment was started, but a urine culture was obtained 48 hours later, and the patient's improvement was evident 18 hours after the double J catheter placement procedure (Figure 4). Blood pressure progressively recovers, so the administration of continuous infusions of vasopressors is reduced.

Additionally, the patient required fewer units of insulin to correct hyperglycemia. After the surgical procedure, metabolic acidosis is compensated for, the leukocyte count decreases to 38,000 U/ μ l, the neutrophil count is 80%, and the renal profile is regulated. At 12 days, the leukocyte count was 19,000 U/ μ l, and 80% of the cells were segmented.

She spent 72 days in intensive care due to complications of cellulitis in the left thoracolumbar subcutaneous tissue. She was transferred to intermediate care for an additional 28 hours and nine days in the hospital. The patient was

discharged without supplemental oxygen support and with outpatient treatment, improving the insulin regimen. In the case follow-up, after 15 days, a control was carried out by an outpatient clinic, with average blood count and urinalysis. Renal echo without alterations of the renal parenchyma revealed that the patient maintained a double J catheter, which was planned to be removed in the third month.

Figure 4. A urotac with a double J catheter was used.



CT of the abdomen and pelvis, coronal section: A double J catheter was inserted into the renal pelvis. The complex has drained the gas and previous pustular contents. However, the incidence of thoracolumbar subcutaneous infection is striking.

Table 1. Urine culture.

Reported colony: <i>Klebsiella pneumoniae</i>	
100,000 CFU/ml	
Amikacin	Resistant
Ampicillin sulbactam	Resistant
Cipro -Levo- Norfloxacin	Resistant
Cefotaxime/Ceftazidime	Resistant
Colistin	Resistant
Fosfomicin	Resistant
Gentamicin	Resistant
Imipenem	Resistant
Nitrofurantoin	Resistant
Piperacillin/Tazobactam	Resistant
Trimethopin/Sulfa	Resistant
Cetaxidime/Avibactam	Sensitive

Discussion

A total of 80% of cases of urinary tract infection in patients with and without diabetes are caused by ESBL+ (positive) *Escherichia coli* bacteria, the primary pathogen that causes pyelonephritis, and the remaining 20% are caused by *Klebsiella pneumoniae* [6]. In the present case, the patient presented with the causative pathogen *Klebsiella pneumoniae* (a bacterium suspected of producing carbapenemase). These findings agree with the reported epidemiology [7].

Early intervention with the double J catheter placement technique proved valuable in patients with pyelonephritis and emphysematous pyelonephritis. We recorded significant improvements 18 hours after the procedure, such as a reduction in leukocytes, a seven mmHg increase in systolic blood pressure, a five mmHg increase in diastolic blood pressure, and a decrease in inflammatory markers with quantitative PCR.

Empirical antibiotic therapy is a pillar for managing these patients in critical clinical conditions; the antibiotics with the best coverage are used. However, this will also depend on the patient; whether the infection is the first or recurrent must be considered, and kidney function must be taken into account when administering the correct dose. The first-line treatment for cases of pyelonephritis and as an empirical treatment refers to starting with ceftriaxone or piperacillin-tazobactam, alternatively levofloxacin 750 mg orally per day. In cases of urinary tract obstruction with hemodynamic compromise, in addition to providing a drainage route such as a nephrostomy or double J catheter, imipenem or meropenem + vancomycin should be administered [8].

Placing a double J drain as a surgical technique is effective for patients who are likely to die. The decision to use a double J catheter improves the clinical picture and changes the prognosis abruptly. However, we do have experience in witnessing cases in which valuable time was lost, patients are sent to us whose kidney tissue is in liquefaction, and the only option remaining is nephrectomy [9]. In diabetic patients, losing a kidney is a significant injury to their life expectancy since the progression of diabetic nephropathy is shortened.

Conclusions

We report a clinical-surgical case that expanded our understanding of the management of emphysematous pyelonephritis. The use of the double-J device in the initial management, plus antibiotic therapy, allowed the patient to recover from septic shock.

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Statements

Ethics committee approval and consent to participate

Clinical cases are not needed.

Publication consent

The authors have permission for the patient to publish the images and photographs.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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Editor's Note

Actas Médicas (Ecuador) remains neutral regarding jurisdictional claims in published maps and institutional affiliations.

Received: March 28, 2024.


Accepted: June 5, 2024.

Published: June 29, 2024.

Editor: Dr. Mayra Ordoñez Martínez.

Cite:

Tenesaca V, Mosquera E, Delgado E. Management of pyelonephritis emphysematous with antibiotic therapy and double J catheter placement: A case report. *Actas Médicas (Ecuador)* 2024;34(1):69-73.

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