

A case of acute pyelonephritis with multiple bilateral pulmonary nodules

Abstract

Acute pyelonephritis, one of the most common kidney diseases, often occurs as a complication of a urinary tract infection (UTI) that has spread from the bladder to the kidneys. Pulmonary cavitory lesions can come from multiple sources, including complications from a UTI if mixed clots of bacteria travel to the lungs or from metastatic cancer. Herein we describe a case of acute pyelonephritis with cavitory pulmonary lesions in a 75-year-old woman with a recent history of UTI. Her condition deteriorated rapidly from the initial admission and required various treatments to stabilize her condition. Ultimately, the patient and her caregiver chose a relatively conservative management course while in our care. This report describes the course of treatment and the patient's and her caregiver's involvement in care decisions.

Keywords: case study-acute pyelonephritis-pulmonary lesions/nodules

Volume 11 Issue 3 - 2022

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Received: December 01, 2022 | **Published:** December 19, 2022

Introduction

Acute infection of the kidney or upper urinary tract (pyelonephritis) can develop when pathogens ascend to the kidneys via the ureters or when bacteria in the lymphatics seeds the kidneys.¹ Though most commonly found in young adult women,² acute pyelonephritis can occur at any age. The only urinary tract infection (UTI) that may require hospital admission and can be fatal is acute pyelonephritis. It is of particular concern in individuals with diabetes,³ the immunosuppressed,⁴ the elderly,⁵ and pregnant women.⁶ Early identification of these subgroups of patients at high risk for in-hospital death, prolonged hospitalization, or failure of treatment might contribute to ameliorative therapy for acute pyelonephritis.

Case history

A 75-year-old white woman with altered mental status, weakness, and confusion was transferred to a regional medical center from a neighboring emergency department. She had a history significant for type 2 diabetes mellitus, hypertension, iron deficiency anemia, and hyperlipidemia. Her current medications include glimepiride, levothyroxine, lisinopril, metformin, simvastatin, sitagliptin, pregabalin, tramadol, and an iron infusion when needed. Approximately 6 weeks before being admitted, she self-treated a self-diagnosed UTI with some antibiotics she had in her home. Over the previous 6 days, she reported concerns to her son (caregiver) of subjective fever and chills and became unable to keep down her food or medications. During the initial workup at the emergency department, she was determined to have a UTI; a computed tomography (CT) scan of the abdomen and pelvis showed perinephric fat stranding of the left kidney consistent with pyelonephritis. Additionally, a chest x-ray showed bilateral pneumonia with nodular opacities. A subsequent chest CT scan raised concerns of atypical fungal or septic emboli. Based on the results of additional laboratory work, the patient was given insulin, intravenous (IV) fluids, antibiotics (meropenem and ceftriaxone), and treated for hyperkalemia.

Upon arriving at our hospital, the patient appeared confused but had vital signs within reference ranges and no evidence of trauma. Initial point-of-care (POC) laboratory investigations were performed. While in our care, the patient became hypotensive with blood pressure (BP) of 77/35 mmHg, heart rate of 112 beats-per-minute, and a respiratory rate of 25 breaths/minute; her oxygen saturation was 100%

on 2 L/min via nasal cannula. After 4 hours, her initial POC laboratory testing was repeated. Based on these results, the patient was started on sepsis protocol; a central line was inserted, and the patient was started on a vasopressor (norepinephrine). Additional testing was performed. While blood cultures showed no growth, the urine culture grew *Candida albicans* sensitive to fluconazole, and the sputum culture found *Klebsiella pneumoniae* susceptible to ceftriaxone. Treatment included one unit of packed red blood cells, norepinephrine infusion (Levophed), an insulin IV drip, and a potassium infusion. Additionally, levofloxacin, meropenem, famotidine IV, and ondansetron IV were given, and deep vein thrombosis prophylaxis was performed. A sodium bicarbonate infusion was started for metabolic acidosis and fluconazole IV for the *Candida* in the urine.

As the patient's BP remained stable over several days, norepinephrine was discontinued. The antibiotics being given were narrowed down to ceftriaxone. A CT of the abdomen and pelvis without contrast showed mild to moderate left hydronephrosis with a 6-mm stone at the level of the left ureterovesical junction (UVJ). Additionally, we noted a 2.4-cm x 1.7-cm exophytic posterior right renal lesion of uncertain etiology. Including the bases of the lungs in the scan revealed multiple bilateral pulmonary nodules. Based on these results, a magnetic resonance image (MRI) of the abdomen without contrast was performed 1 day later. There was a diffuse abnormal signal of the left kidney with diffuse foci of restricted diffusion suggestive of underlying malignant involvement. Also, there was a large perinephric/exophytic mass extending from the posterior aspect of the right kidney measuring 4.1 x 1.7 cm—this was notably larger than initially reported on the CT but is atypical for primary renal cell carcinoma. Note that there are limitations to this study due to the lack of contrast used in the scans.

At this time, a nephrologist and urologist were consulted. The patient's serum urea nitrogen and creatinine levels remained elevated. While the patient's fluid balance was positive (>1000 ml), output was bloody, dark, and concentrated; the patient was at high risk for requiring hemodialysis. Additionally, we noted that the patient's platelet count was dropping throughout her hospital stay but with no evidence of major bleeding. On day 5, the patient underwent a cystoscopy and ureteral stent placement for the left UVJ stone. Her urine output improved gradually after the procedure but remained darker and more concentrated. Despite her low platelet count, per the advice of a hematologist, a transfusion was not performed as

her platelet count did not fall below 10,000 platelets/ μL , and there was no evidence of bleeding. The patient was put on a sliding scale basal insulin, and her glucose level improved. Due to the patient's low platelet count, we did not perform a biopsy of the kidneys to rule out primary renal cell carcinoma with possible metastatic disease to the lung. After a discussion of the case and associated risks with the patient and her son, the patient decided to be transferred to a nursing home near her son in the family's hometown that is more than two hours away. Follow-up was to be performed by her primary care physician and a local hematologist and nephrologist.

Discussion

Kidney stones are a relatively common disorder, occurring in approximately 8 in 1,000 adults annually; active addressing of stones is recommended in some instances, such as a UTI or when a stone is larger than 10 mm.⁷ Acute kidney injury is often associated with acidosis, and it is common practice to administer sodium bicarbonate,⁸ as was done in our case. Also, even in patients that generally do not require it, insulin may be necessary to maintain glucose levels lower than 180 mg/dL during sepsis.⁹

While most specialists agree that spontaneous bleeding is unlikely to occur unless platelet count falls below 10,000/ μL , other factors, including comorbidities and medications, can increase the likelihood of bleeding.¹⁰ In these cases, a higher platelet count may be maintained via transfusions.

As seen in our patient, multiple pulmonary nodules can potentially be caused by blood clots mixed with bacteria or metastatic cancer.¹¹ In this case, based on the infection status of the patient and the unknown characteristics of the nodule observed on the kidney, either of these is a reasonable possibility. Renal cell carcinoma can metastasize and include involvements of the lungs, liver, and skeletal system.¹² Additionally, the difference in the observed size of the mass could be attributed to masses sometimes appearing larger on MRI.¹³

This case is a relatively atypical presentation of acute pyelonephritis; the pulmonary nodules, renal mass, and kidney stone were unexpected findings. Considering her chronic medical conditions (diabetes, chronic anemia, and hypertension), we were surprised that the patient was only evaluated by their primary care physician once per year. A simple urinalysis can detect the presence of hematuria—the detection of which would have triggered a follow-up and investigation. Standard care of a patient with these known comorbidities should have included more follow-up and routine laboratory work that may have identified these unexpected findings sooner, including the possibly metastatic mass on the kidney.

It is important to note that patient preference needs to be involved in care decisions. The nephrologist explained the risks of the biopsy and transfusion to the patient, to which the patient responded that there was no need and that she just wanted to be comfortable. Regardless of the potential outcome, it is crucial to inform patients of the benefits and risks of malignancy management and incorporate their preferences into care.¹⁴

Conclusion

We presented a case of what initially appeared to be a simple UTI but rapidly deteriorated into a series of more complex conditions (i.e., acute kidney injury and septic shock secondary to acute pyelonephritis). As part of our investigation of acute pyelonephritis, multiple additional medical problems were uncovered (i.e., bilateral pneumonia, pulmonary lung nodules, and renal lesion); of note, before the UTI, the patient had no symptoms of hematuria, back pain,

abdominal pain, persistent cough, shortness of breath, or difficulty breathing, as per her son (her caregiver). While the patient's meager output put her at high risk of requiring hemodialysis, it gradually increased to an acceptable range via relatively conservative care, and she did not have to undergo dialysis.

The pulmonary lung nodules and exophytic renal lesion were unexpected findings. Given the patient's relative vulnerability (e.g., low platelet count), performing a biopsy may have led to fatal bleeding. While not confirmed by biopsy, the mass in the right kidney is likely the primary lesion. While our medical group wanted to do more for the patient, we decided on a more conservative approach after consultation with the patient and her caregiver, who responded that there was no need for further evaluation or treatment and that patient just wanted to be comfortable. It is important to remember that, ultimately, the informed patient's decision concerning their care must be respected.

Acknowledgments

None.

Conflicts of interest

The author declares that there is no conflict of interest.

Funding

None.

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