Emphysematous Cystitis in a Patient Receiving Cyclophosphamide

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Abstract

Emphysematous cystitis (EC) is a form of complicated urinary tract infection (UTI) well described in patients with diabetes. Other known risk factors include urinary tract obstruction, older age, and female gender. This case describes a patient who developed emphysematous cystitis while receiving induction therapy with intravenous cyclophosphamide to treat antineutrophil cytoplasmic antibody (ANCA)-associated vasculitis that presented with rapidly progressive glomerulonephritis (RPGN). The association between cyclophosphamide therapy and emphysematous cystitis has only been reported twice in literature.

Introduction

Emphysematous cystitis (EC) is a form of complicated urinary tract infection (UTI) characterized by air within the bladder wall usually caused by air-forming bacteria [1] and can be life-threatening. Almost two-thirds of patients with EC are diabetics and older females [1]. A recent review of 113 cases of emphysematous cystitis found that other risk factors were neurogenic bladder (9.73%), malignancy on chemotherapy (8.85%), and, even less frequently, immunosuppressed state (transplant recipient) and post-surgery [2]. Only two previous case reports available in the literature have described the association between cyclophosphamide use and EC [3,4].

Case Presentation

An 83-year-old female with a history of hypertension, atrial fibrillation, factor V Leiden mutation, deep vein thrombosis on warfarin, grade 2 cystocele, grade 2 rectocele, and gastroesophageal reflux disease presented to the emergency room with worsening weakness for few days, in addition to dizziness and a lower blood pressure than baseline. She also reported abdominal pain, nausea, and diarrhea. The patient denied any associated dysuria or hematuria. The patient did not report shortness of breath, but her family noticed that she had been tachypneic. Additionally, for 14 weeks prior to presentation, the patient had been receiving induction therapy with intravenous cyclophosphamide infusions and steroids taper for the management of her antineutrophil cytoplasmic antibody (ANCA)-associated vasculitis that manifested as rapidly progressive glomerulonephritis (RPGN) with gross hematuria.

In the emergency room, the patient was alert and oriented and in moderate distress. She had a blood pressure of 107/66 mmHg, a heart rate of 96 beats/minute, a respiratory rate of 18 breaths/minute, a temperature of 97.9°F, and an oxygen saturation on room air of 96%. Her abdomen was soft with mild diffuse tenderness and no guarding or rebound tenderness.

Her most relevant blood tests in the emergency room are summarized in Table 1 and urinalysis with microscopy in Table 2.
| Test                  | Result     | Reference range |
|----------------------|------------|-----------------|
| Blood urea nitrogen  | 58 mg/dL   | 6–20 mg/dL      |
| Creatinine           | 1.97 mg/dL | 0.5–1.2 mg/dL   |
| Glucose              | 177 mg/dL  | 70–99 mg/dL     |
| Potassium            | 3.6 mg/dL  | 3.5–5.1 mg/dL   |
| Lactic acid          | 3.0 mmol/L | 0.5–2.2 mmol/L  |
| White blood cell count | 8.4 K/uL    | 4.8–10.8 K/uL   |
| Hemoglobin           | 9.7 g/dL   | 12–15.5 g/dL    |
| Platelet count       | 221 K/uL   | 150–350 K/uL    |

**TABLE 1: Blood test results**

| Test                        | Result     | Reference range |
|-----------------------------|------------|-----------------|
| Glucose – urine             | Negative   | Negative        |
| Blood – urine               | 3+         | Negative        |
| Protein – urine             | 1+         | Negative        |
| Urine nitrates              | Negative   | Negative        |
| Leukocyte esterase          | 1+         | Negative        |
| White blood cell count – urine | 15–20 cells/HPF | 0–2 cells/HPF |
| Red blood cells – urine     | 5–10 cells/HPF | 0 cells/HPF    |

**TABLE 2: Urinalysis**

Computed tomography (CT) scan of the abdomen showed emphysematous cystitis with large amount of intraluminal gas in the urinary bladder and gas within the walls of the bladder. There was no gas seen within the pyelocaliceal systems or ureters (Figure 1). The CT also showed chronic appearing interstitial infiltrates in both lung bases.
The patient was admitted to the hospital and started on ceftriaxone 1 gram intravenously daily and given normal saline solution at 100 mL/hour intravenously for her sepsis. A urinary catheter was not placed at any point during her hospital admission. Her blood cultures were positive for *Escherichia coli* (*E. coli*) in all four bottles and sensitive to most antibiotics including ceftriaxone. Urine culture unfortunately was not obtained upon admission. Two days later, the patient developed a fever of 101°F. However, the repeat blood and urine cultures at that point were all negative. During her hospital stay, the patient was noted to have postprandial hyperglycemia reaching up to 240 mg/dL. Her hemoglobin A1C was 7.8%. Her chart review revealed almost annual hemoglobin A1C results that never exceeded 6% in the past.

On day 8 of her admission, the patient had worsening shortness of breath, low-grade fever of 100.9°F, and elevated white blood cell count of 11.9 K/uL (normal range: 4.8-10.8 K/uL). Her urine microscopy did not reveal any white blood cells. Chest X-ray revealed multifocal pneumonia. CT scan showed marked improvement in her emphysematous cystitis (Figure 2). Her antibiotic coverage was switched to vancomycin and piperacillin/tazobactam for the treatment of her hospital-acquired pneumonia. The patient responded well to the pneumonia treatment and was discharged home after one week.

**Discussion**

Emphysematous cystitis (EC) is a rare complication of urinary tract infection characterized by air within the bladder lumen or bladder wall usually caused by air-forming bacteria. In a recent review of 113 cases [2],...
**Additional Information**

**Disclosures**

**Human subjects:** Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work. Financial relationships: All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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