Case Report

Emphysematous Cystitis: A Rare Disease of Genito-Urinary System

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Abstract

Context: Emphysematous cystitis (EC) is a rare infection of the urinary tract that results in gas production in the bladder. It is more common in diabetic and female patients, and can be associated with more serious complications, including pyelonephritis. **Case Report:** We describe a case of recurrent bacterial cystitis caused by *Escherichia coli* (*E. coli*). An incidental finding in our patient of pneumaturia on computed tomography (CT) scan prompted further work-up. Differential diagnoses for pneumaturia include infection, trauma, and fistula, most commonly colovesicular. The patient history ruled out trauma and CT scanning ruled out a fistula; culture of the urine then showed a bacterial load greater than 100,000 *E. coli*/mL. The patient was then diagnosed with EC. She was treated with ceftriaxone and released in stable condition. **Conclusion:** The literature was scarce when it came to diagnoses of EC based on bacterial load. We present this case to increase health care providers' awareness of recurrent EC with a urine culture bacterial load greater than 100,000 *E. coli*/mL.

Keywords: Bacteriuria, Cystitis, Emphysematous cystitis (EC), *Escherichia coli* (*E. coli*), Pneumaturia, Pyelonephritis, Urine culture

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Introduction

Emphysematous cystitis (EC) is a rare urinary tract infection caused by gas-producing bacteria colonizing the urinary bladder. Diabetic and female patients are at highest risk of developing EC. The typical presentation of EC includes lower abdominal pain, bacteremia, and dysuria. Urinalysis typically shows bacteriuria, pyuria, and hematuria.[1] Treatment of EC is based on severity. The initial treatment typically includes parenteral antibiotic administration and possibly percutaneous catheter drainage.[2] In the most extreme cases, where the kidney is involved, nephrectomy can be performed to be curative.[3] We present the case of a diabetic female patient diagnosed with EC and a bacterial load greater than 100,000 *Escherichia coli* (*E. coli*)/mL on four different occasions.

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Case Presentation

A 67-year-old woman presented to the emergency department with right hip pain secondary to a fall. The patient's vitals on presentation were as follows: Blood pressure (BP) 152/93 mmHg, heart rate (HR) 88 bpm, respiratory rate (RR) 20 breaths/min, temp. 97.9°F, and O_2 sat. 96% on room air (RA). The patient had a past medical history of chronic EC, diabetes mellitus (DM), peripheral neuropathy, arthritis, coronary artery disease, and asthma. The patient underwent a right lower extremity computed tomography (CT) without contrast and was found to have a subcapital fracture with mild dorsal angulation. An incidental finding on the CT was pneumaturia, which was probably due to a case of EC [Figure 1]. Because of the finding of pneumaturia, pelvic CTs with and without contrast were ordered to rule out a colovesicular fistula, and one midstream catch sample and one catheterized sample of urine were taken and cultured. The CT scans ruled out any fistulas, and both urine samples were found to contain greater than 100,000 *E. coli*/mL. The patient

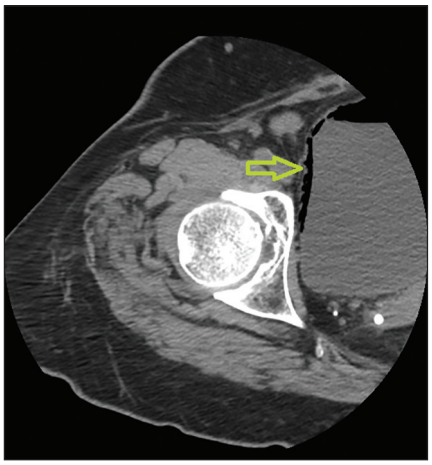

Figure 1: Incidental finding on the CT of pneumaturia, suggestive of EC

was then treated with ceftriaxone 1,000 mg for 5 days, and was released in stable medical condition. On further examination of the patient's other medical records, three prior hospital admissions with the *E. coli* cystitis were noted, each with approximately the same bacterial load.

Discussion

Pyelonephritis, uncomplicated cystitis, and EC can be difficult to differentiate symptomatically. Each can present with dysuria, abdominal pain, burning sensations during urination, and hematuria.[4] While not specific to EC, pneumaturia will only occur in EC if present and can help the clinician decide between a diagnosis of EC and pyelonephritis or cystitis. EC is found predominantly in females over 60 years of age, with 60-70% of cases being among diabetic patients.[1]

The most sensitive measure to diagnose EC is the presence of gas pockets surrounding the urinary bladder on CT.[5] A urinalysis is nonspecific and closely resembles that of pyelonephritis with the presence of red blood cells, white blood cells, and numerous bacteria.[6] Medical therapy is the most common and sufficient treatment.[5] If left untreated, bacteremia will develop in 50% of cases.[1]

Currently, the pathogenesis of how gas forms in the bladder is unknown. One theory postulates that gas formation occurs when bacteria such as *E. coli* ferment the glucose in the urine. This explains the higher rates of infection in diabetic patients. In nondiabetic patients, local inflammation and impaired circulation have been postulated as mechanisms of pathogenesis.[7]

One complication of EC is emphysematous pyelonephritis. The presentation is similar to acute pyelonephritis, with symptoms including abdominal flank pain, leukocytosis, fever, chills, nausea, and vomiting.[8] It is typically discovered with an abdominal CT scan. The treatment includes systemic antibiotics and open drainage or, in severe cases, emergent nephrectomy.[9]

Our patient's presentation and labs fit the classic description and findings of EC. One parameter not discussed in the literature is the bacterial load of EC. Our patient's bacterial load was over 100,000 *E. coli*/mL. We present this case to increase health care providers' awareness of recurrent EC in diabetic women.

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