Emphysematous Cystitis in a Diabetic patient:
A case report

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ABSTRACT

Emphysematous cystitis is a rare bacterial infection of urinary bladder wall and is characterized by the presence of gas in the bladder wall, lumen, and surrounding tissues. Diabetes mellitus, dysuria, and neurogenic bladder with voiding dysfunction are the most important risk factors associated with this infection, which predominantly occurs in females. Here we present a case of emphysematous cystitis in a 54-year-old female with diabetes mellitus. Her symptoms improved following treatment with intravenous antibiotics, drainage of urinary bladder, and control of blood sugar level; she was discharged 15 days after admission.

Keywords: emphysematous cystitis; diabetes mellitus; computed tomography

INTRODUCTION

Emphysematous cystitis (EC) is a rare urinary tract infection (UTI) that occurs when gas-producing bacteria colonize the urinary bladder. It is characterized by the presence of air within the urinary bladder wall and/or the presence of intraluminal air in the bladder. Diabetic and female patients are at the highest risk of developing EC (1). Major risk factors for EC include bladder dysfunction, such as neurogenic bladder, and recurrent UTI. However, the strongest risk factor has been demonstrated to be diabetes mellitus (DM), which is seen in two-thirds of all cases (2). Here, we report the case of a middle-aged diabetic female patient with neurogenic bladder and voiding dysfunction who presented with dysuria and lower abdominal pain and was diagnosed with EC caused by infection with extended-spectrum, β-lactamase-producing Escherichia coli, which was responsive to antibiotic treatment. Her symptoms improved with our treatment including intravenous antibiotics, drainage of urinary bladder and control of the blood sugar.
CASE REPORT

A 54-year-old woman presented to the emergency department with a 2-week history of lower abdominal pain and dysuria. She also had a history of DM with a neurogenic bladder and frequent urine retension and UTI caused by voiding dysfunction. On arrival, all her vital signs were noted to be in the normal range. Physical examination revealed lower abdominal pain without the presence of rebound tenderness. Laboratory test results showed an elevated blood sugar level of 239 mg/dL and a white cell count of 17950/mm$^3$; all other blood parameters were within the normal range. Urine analysis findings revealed white cell count 652 per high power filed, and ultrasonography showed irregular thickening of the urinary bladder wall. The abnormal ultrasound findings, together with prolonged lower abdominal pain and dysuria, suggested complicated lower UTI. Therefore, an abdominopelvic computed tomography (CT) was performed, which revealed gas bubbles within the wall of the urinary bladder, resulting in the diagnosis of EC (Figure 1A-C, arrows). Since ureteral obstruction or pyelonephritis was not observed, the patient was diagnosed with EC based on CT findings. Urine cultures were obtained and a Foley catheter was inserted. The patient received empirical intravenous antibiotic treatment with ceftriaxone after catheter drainage. As the urine culture yielded extended-spectrum, β-lactamase-producing *E. coli*, the administered antibiotic was modified to invanz. However, the blood cultures remained negative. Her symptoms improved with treatment and she was discharged 15 days after admission.

DISCUSSION

EC is a rare UTI caused by colonization of the urinary bladder by gas-producing bacteria such as *E. coli* and *Klebsiella pneumoniae*. Typical symptoms are similar to those of uncomplicated UTIs, and include dysuria, hematuria, frequent urination, fever, and possible suprapubic pain. Pneumaturia, although more specific, is a rare presenting symptom, and some patients may be completely asymptomatic at the time of incidental diagnosis (2,3). Although the overall incidence of EC is unknown, it shows a female predominance (female-to-male ratio, 2:1) (1,2). Other predisposing risk factors include being of advanced age, debilitated, or immune deficient or having bladder obstructions, chronic UTIs, neurogenic bladder, or chronic indwelling bladder catheters (2,3). The majority of EC cases (>60%–70%) are caused by *E. coli* infection, as in our case (2,3). Other common bacterial pathogens include the *Enterobacter* species, *K. pneumoniae*, *Staphylococcus aureus*, Prote-
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us mirabilis, Pseudomonas aeruginosa, and the Streptococcus species. Fungi, such as the Candida species, present a less common cause (2). Imaging methods play an important role in the diagnosis of EC, and a plain x-ray of the abdomen and pelvis can reveal air fluid levels in the bladder with a typical cobblestone appearance. A rim of gas lucency outlining the wall of the bladder is suggestive of EC, although the presence of bowel gas can present a problematic feature (4). CT of the abdomen is superior to plain x-ray images as a diagnostic tool because it can precisely define the extent and location of the gas collection, and clearly show associated complications, if any. CT can also be used to differentiate between EC and emphysematous pyelonephritis, where the latter involves gas collection in the renal parenchyma. Emphysematous pyelonephritis has a higher mortality rate and generally necessitates nephrectomy. Comparatively, EC rarely requires surgical intervention (5).

Management of EC has remained unchanged over the last 30 years, and broad-spectrum intravenous antibiotics are used until urinary pathogen sensitivities are known (6). Concurrently, the urinary bladder should be drained and blood glucose levels should be controlled. Between 10% and 20% of documented patients with EC undergo surgical intervention, (1,2) due to progressive and extensive emphysematous UTI. The exact mechanism of gas production in emphysematous infection is not quite clear. In diabetic patients, one of the reasons appears to be the microbial production of CO₂ by glucose fermentation, which occurs when blood glucose concentration is high. However, as emphysematous infections can also occur in nondiabetic patients, it has been suggested that urinary lactulose and tissue proteins may serve as substrates for gas production (7). Other factors that can facilitate gas accumulation include impaired transportation of gas due to local inflammation or obstructions that increase local pressure and decrease circulation (6). Clinical subcutaneous emphysema is a rare complication of EC that appears to have poor prognosis. Only careful clinical judgment and a high degree of suspicion can lead to its early diagnosis and treatment, (8) while delayed diagnosis may lead to unfavorable outcomes including overwhelming infection, extension of infection to the ureters and renal parenchyma, bladder rupture, and finally death. Improved outcomes may be achieved by early recognition of infection, its clinical and radiological assessment, and appropriate antibiotic therapy (9).

In conclusion, EC is a relatively rare form of complicated UTI that is characterized by the presence of gas within the bladder wall and the lumen. The predisposing risk factors include older age, female gender, and severe DM. No significant clinical features that are strongly suggestive of EC have been reported to date; hence, physicians should be aware of subtle symptoms pointing toward this condition (e.g., abdominal pain, fever, and hematuria). Although EC is potentially life-threatening, early medical intervention, including antibiotic therapy, bladder drainage, and glycemic control can contribute toward achieving a favorable prognosis without the requirement of surgical intervention (10). Emergency physicians should be aware of the radiological and variable clinical findings of EC, especially in diabetic patients with neurogenic bladder and voiding dysfunction, to ensure early diagnosis and timely medical intervention, and to achieve a favorable outcome.
REFERENCES


糖尿病病患的產氣性膀胱炎：病例報告

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中文摘要

產氣性膀胱炎是一種罕見的細菌性膀胱感染，代表在於膀胱壁被產氣性的感染（gas-production infection）造成膀胱壁組織內出現氣泡性的膀胱炎。最重要的危險因素是糖尿病疾病，排尿困難和神經源性膀胱的病患，主要女性發生的比較多。我們報告一位 54 歲的糖尿病女性產氣性膀胱炎病例，治療有掛靜脈注射抗生素，膀胱引流。入院 15 天治療後症狀好轉，且平安出院。

關鍵字：產氣性膀胱炎；糖尿病；斷層掃描

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