

# EMPHYSEMATOUS CYSTITIS, A RARE COMPLICATION OF URINARY TRACT INFECTION IN A MALE DIABETIC PATIENT: A CASE REPORT

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Emphysematous cystitis is a rare complication of urinary tract infection, characterized by spontaneous gas formation in the urinary bladder due to bacterial fermentation. Approximately 50 to 80% of patients with this disease are diabetic, and there is a higher incidence in females. We report a case of emphysematous cystitis in a diabetic male who was admitted under the impressions of hypoglycemia, acute bronchitis, and chronic renal failure. Treatment of the emphysematous cystitis consisted of adequate urinary drainage, empirical antibiotic therapy, and strict blood sugar control. The patient recovered satisfactorily after 9 days of hospitalization.

**Key Words:** emphysematous cystitis, gas formation, diabetes mellitus, urinary tract infection

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Diabetic patients are susceptible to an increased incidence of urinary tract infection (UTI) and its complications. An early and correct diagnosis of UTI in diabetic patients followed by adequate treatment will prevent the disease from developing into a serious or life-threatening condition, such as sepsis. Herein, a rare complication of UTI in a diabetic male is reported.

## CASE PRESENTATION

A 62-year-old male had had type 2 diabetes mellitus for more than 10 years. He controlled his diabetes irregularly with an oral hypoglycemic agent (glyburide

5 mg daily) purchased from a drugstore for 5 years. He had a history of chronic renal failure diagnosed 5 years ago in our hospital, when his blood urea nitrogen (BUN) was 37.8 mg/dl and creatinine was 3.7 mg/dl, but he was lost from follow-up several months later. On August 28, 2001, he was brought to our emergency room (ER) in the early morning due to loss of consciousness. His family also noticed that he had had a cough with yellowish sputum in the previous week but denied that he had fever, hemoptysis, sore throat, dyspnea, or orthopnea. He had described no burning voiding, dysuria, polyuria, flank pain, lower abdominal pain, or pneumaturia, but nocturia (3 to 4 times every night) had been noticed for several years.

On physical examination in the ER, the patient was comatose. His vital signs were: blood pressure 220/93 mmHg, pulse rate 86/minute, respiratory rate 16/minute, and body temperature 35.7°C. Cardiovascular examinations were unremarkable. Breathing sounds revealed bilateral inspiratory crackles in both lung fields. The abdomen was soft without organomegaly or mass; there was no knocking pain over bilateral

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flanks or the lower abdominal area. There was no pitting edema in his legs. His fingertip blood sugar was only 20 mg/dl immediately after his arrival in the ER. Glucose water (50%) was given intravenously and he recovered consciousness. Laboratory data showed white blood cell (WBC) count of  $11,710/\text{mm}^3$  with 86.3% neutrophils, hemoglobin of 11.3 g/dl, hematocrit of 31.9%, platelet count of  $192,000/\text{mm}^3$ , serum sodium of 141 Meq/L, serum potassium of 3.7 Meq/L, serum chloride of 120 Meq/L, aspartate aminotransferase of 27 IU/L, alanine aminotransferase of 12 IU/L, BUN of 56 mg/dl, creatinine of 4.1 mg/dl, C-reactive protein (CRP) of 87.5 ng/ml, hemoglobin A<sub>1c</sub> (HbA<sub>1c</sub>) of 5.9%, and daily protein loss of 2.926 g. Chest roentgenography showed increasing infiltration in both lung fields, so he was admitted under the impressions of hypoglycemia, acute bronchitis, and chronic renal failure.

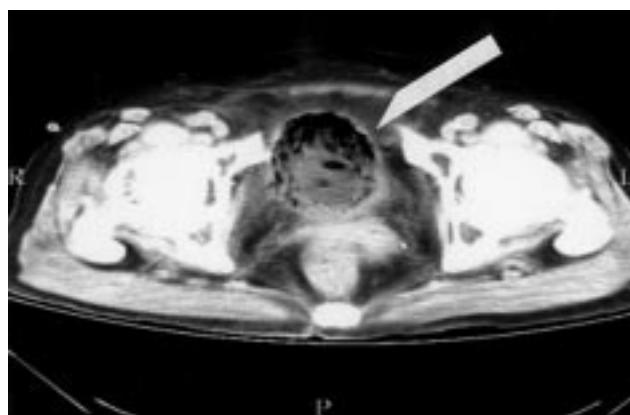
After admission, routine urinary analysis revealed occult blood (3+), proteinuria of at least 300 mg/dl, and positive dipstick examination for nitrate. Microscopic examination showed some organisms, WBC count of 10–25/high-power field (HPF), and RBC count of 10–25/HPF, but no cast. Roentgenography of the kidneys, ureter, and bladder (KUB), ordered because of pyuria, showed a thin layer of gas around the bladder wall (Figure 1A). Renal ultrasound showed bilateral renal parenchymal disease but no clear image of the urinary bladder, so pelvic computerized tomography (CT) was performed and emphysematous cystitis was confirmed (Figure 2). Empirical antibiotics (first-generation cephalosporin plus aminoglycoside) were initially given for acute bronchitis. He was treated with broader spectrum antibiotics (second-generation cephalosporin plus aminoglycoside) after emphysematous cystitis was diagnosed 2 days later. He was catheterized for urinary drainage and his blood glucose was closely checked and controlled with insulin simultaneously. Urine culture subsequently revealed more than  $10^5$  colony-forming units/ $\text{mm}^3$  of *Escherichia coli* sensitive to cephalosporin and aminoglycoside. Blood and sputum cultures were negative. Infectious parameters (general condition, WBC count, CRP) and cough improved within 2 days of antibiotic treatment. KUB on the fifth day showed the disappearance of gas distribution in the bladder wall (Figure 1B). He was discharged on oral antibiotics, repaglinide 0.5 mg tid, and captopril 12.5 mg tid after 9 days of hospitalization.



**Figure 1.** (A) Roentgenogram of the kidneys, ureter, and bladder (KUB) demonstrates gas outlining the bladder wall; (B) disappearance of the gas around the bladder wall on KUB after antibiotic therapy for 4 days.

## DISCUSSION

Emphysematous cystitis is a rare disease associated with air accumulated in the urinary bladder [1–3]. More common causes of air in the bladder are vesicocolic or vesicovaginal fistula, which are associated with infection or neoplasm outside the bladder [4]. Emphysematous cystitis, however, results from a



**Figure 2.** Pelvic computerized tomography shows gas accumulating in the bladder wall and lumen.

primary infection of the bladder. Approximately 50 to 80% of patients with this disease are diabetic [1–3]. A higher incidence is observed in females and patients who have a history of recurrent UTI, glycosuria, and urinary stasis due to neurogenic bladder or obstruction [5]. Patients with emphysematous cystitis usually present with symptoms of lower UTI such as frequency, urgency, nocturia, and dysuria [4,5]. Lower abdominal pain is often present and may be chronic [4]. Typically, patients do not appear very ill. Pneumaturia is a specific sign that strongly suggests the diagnosis of emphysematous cystitis [1,4,5], and is only rarely found in these patients. No signs of lower UTI were noticed by our patient, and only asymptomatic pyuria was found after routine urinalysis. Interestingly, he was a male diabetic patient and his HbA<sub>1c</sub> was 5.9%.

The diagnosis of emphysematous cystitis is usually made when abdominal roentgenography shows a round, thin layer of gas outlining the bladder wall or gas in the bladder lumen, and an air-fluid level. Renal ultrasound may show diffuse thickening of the bladder wall [4]. CT is a good tool to identify gas in the bladder wall and extension into the lumen [6], which is often found incidentally on roentgenograms for other purposes [5]. The mechanism of gas formation is believed to be the fermentation of glucose to carbon dioxide by gas-producing organisms in the bladder [7]. Emphysematous pyelonephritis is thought to have a similar mechanism [8]. This patient was suspected to have emphysematous cystitis from KUB for his asymptomatic pyuria, and pelvic CT further confirmed the diagnosis.

*E. coli* is usually the major pathogen of emphysematous cystitis, as in this patient. *Aerobacter*, *Klebsiella*, *Proteus* species, *Staphylococcus*, *Streptococcus*, *Nocardia*, and *Clostridium* have also been described [2,4,5]. *Candida* was also reported in association with long-term broad-spectrum antibiotic therapy and an indwelling Foley catheter [9].

The treatments for emphysematous cystitis consist of the administration of appropriate antibiotics and strict blood sugar control. Bladder rest, with continuous catheter drainage, is also recommended, particularly in patients with neurogenic bladder or a history of urinary retention [5]. Clinical improvement and

roentgenographic resolution occur rapidly, usually within 4 days [1]. Surgical intervention is rarely necessary, except when associated with obstruction, stone, or anatomic abnormality. This patient was treated with parenteral antibiotics and adequate urinary drainage. He achieved rapid improvement in infectious parameters (general condition, WBC count, CRP, disappearance of pyuria in urinalysis) and roentgenographic resolution within 4 days of initiation of antibiotic therapy, which is comparable with previous reports.

## SUMMARY

We reported a case of emphysematous cystitis. The patient was a diabetic male and was admitted under the impressions of hypoglycemia, acute bronchitis, and chronic renal failure. Treatment for the emphysematous cystitis consisted of adequate urinary drainage, empirical antibiotic therapy, and strict blood sugar control. The prognosis of emphysematous cystitis is usually excellent.

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