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Emphysematous Cystitis with Bladder Rupture

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Abstract

Emphysematous cystitis is a rare urinary tract infection. It is an infection of the bladder, usually by the *Enterobacter species* that causes the formation of gas in the lumen of the bladder as well as in the bladder wall. The clinical presentation is varied and so is its prognosis. Failure to recognize emphysematous cystitis early in the course of the disease contributes to the 20% mortality rate of this condition. We report a patient with emphysematous cystitis which led to bladder rupture because of delayed treatment.

Key Words : Bladder rupture, Emphysematous cystitis

Introduction

Emphysematous cystitis is an infection of the bladder, usually by the *Enterobacter species* that causes the formation of gas in the lumen of the bladder as well as in the bladder wall. Patients with diabetes mellitus, neurogenic bladder and chronic urinary tract infection are predisposed to the disease. The clinical presentation is varied and emphysematous cystitis has a varied prognosis, yet delays in its diagnosis and treatment contribute to a mortality rate over 20% in perforated cases [1]. We report an emphysematous cystitis caused bladder rupture case, where the diagnosis and treatment were delayed.

Case Report

A 53-year-old woman with a chronic renal failure on hemodialysis, Parkinson's disease, visited the emergency room because of general fatigue, anorexia, febrile chilling sensation, foul odor urethra discharge for 3 weeks. She had no history of hypertension, diabetes mellitus (DM), or alcohol or tobacco

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consumption.

Her vital signs were as follows: blood pressure, 60/40 mmHg; heart rate, 124 beats/min; respiration rate, 20/min; and body temperature, 39.2℃. Initial physical examination revealed mildly distended lower abdomen, mild suprapubic tenderness and tympanic on percussion. There were no peritoneal signs, and bowel sounds were normal. There was no costovertebral angle tenderness. Laboratory tests gave the following result: white blood cell (WBC) counts, 19,300; segmented neutrophils, 90.0%; hemoglobin, 6.4 mg/dl; platelet count, 292,000/㎕; blood urea nitrogen, 54.0 mg/dl; creatinine, 7.3 mg/dl; aspartate aminotransferase, 95 U/l; alanine aminotransferase, 18 U/l; C-reactive protein, 41.0 mg/dl; and urinalysis, WBC many/HPF and RBC many/HPF.

After a central venous catheter was placed, blood pressure was controlled by isotonic fluids and empirical antibiotics were initiated for the sepsis. And a urinary catheter was inserted to drain turbid urine with gross hematuria and pneumaturia.

A plain radiograph of the kidney-ureter-bladder showed suspicious intraluminal air within the urinary bladder (Fig. 1). The abdominal computed tomography (CT) scan revealed the presence of a thickened bladder wall with intramural and intraluminal gas bubbles and opacification of the perivesicular fat. Due to evidence of urinary bladder dome perforation at abdominal CT scan (Fig. 2), cystography was performed to confirm intraperitoneal urinary bladder rupture. The cystography revealed that a contrast media leak from bladder cavity to intraperitoneum (Fig. 3).

The intraperitoneal bladder rupture was assessed to have been caused by emphysematous cystitis and surgery was considered. But the blood pressure of the patient was not normalized, so we considered an surgical treatment after systemic infection controlled in antibiotic treatment and the vital sign was normalized. Results from the laboratory urine and blood culture, showed *Escherichia coli* that was sensitive to third generation cephalosphorin.

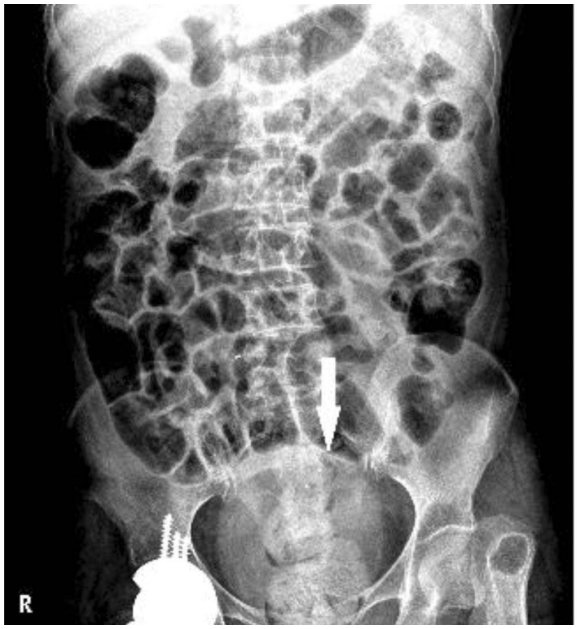

Fig. 1. Plain radiograph of the kidney-ureter-bladder shows suspicious intraluminal air within the pelvis (arrow).

On day 5, antibiotics were changed because her fever was uncontrolled since the patient's visit to the emergency room. And sputum culture exam was performed because of a continuous oral secretion and uncontrolled fever. Result from the laboratory sputum cultures showed methicillin-resistant *staphylococcus aureus*. Despite added vancomycin, followed sputum cultures showed repeated growing of methicillin-resistant *staphylococcus aureus*. Consequently

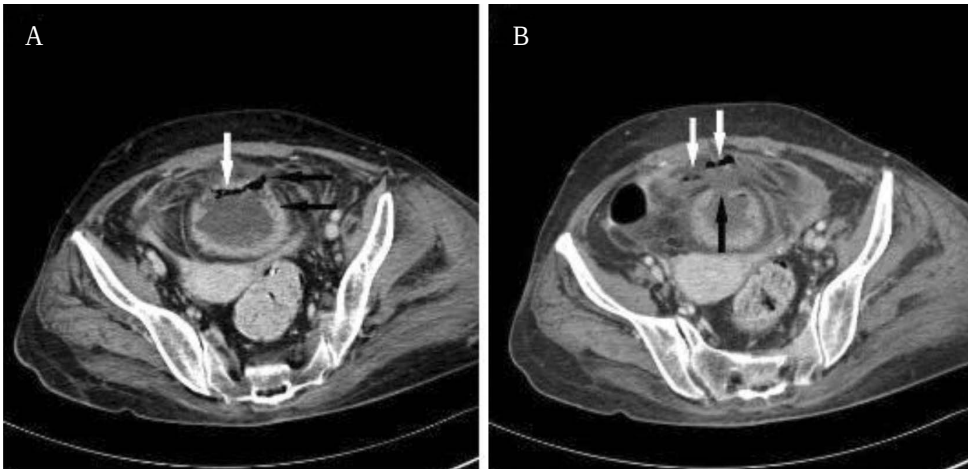

Fig. 2. Computed tomographic scans of the pelvis shows emphysematous cystitis with bladder perforation. A: There is a collection of air within the urinary bladder (white arrow) as well as multiple smaller locules of air more peripherally (black arrows). B: There is a gas accumulation in the perivesical fat tissues (white arrows). And defect of bladder wall is seen at dome of urinary bladder (black arrow).

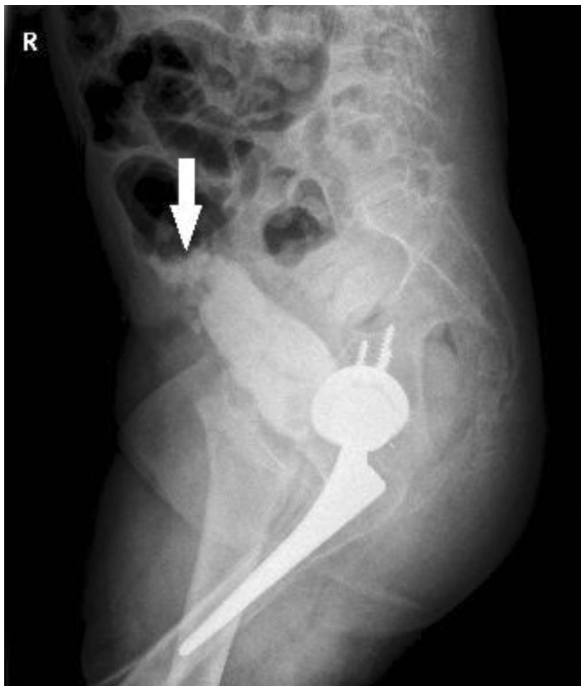

Fig. 3. Retrograde cystography of right decubitus view reveals intraperitoneal leakage of the contrast media (arrow).

repeated blood and urine cultures were performed. No more species were grown in the urine culture, but *candida albicans* were grown in blood culture. So fluconazole was added intravenously. After 3 days, no more species were grown in blood and urine culture.

After the systemic infection was controlled, surgical approach was considered. But, on day 10, the patient showed cyanosis, loss of consciousness, and cardiac arrest. Cardiac arrest was caused by hypoxia due to upper airway obstruction. Stuporous mentality and post-hypoxic myoclonus, caused by with hypoxic brain damage, was continued. The patient kept ventilator care. The family did not consent to the procedure, and they hoped to do supportive care. After 2 weeks, the patient died at a local hospital.

Discussion

Emphysematous cystitis was described in 1671 for the first time as "passed wind through the urethra." [2]. Thomas *et al.* found 135 cases of emphysematous cystitis through

the review of 2007 papers published between 1956 and 2006 [3]. Emphysematous cystitis is urinary tract infection relatively not common. Emphysematous cystitis is a distinct, complicated necrotizing infection of the lower urinary tract characterised by gas collection within the urinary bladder wall and lumen, resulting from gas producing pathogens [1,3,4].

Gas-forming bacteria transform acid into carbon dioxide when urine pH is 6 or lower [5]. Furthermore, long-term glycosylation in DM patients induces blood vessel damage leading to gas deposition [3]. There is a theory suggesting that in patients without DM, albumin should be a substrate that makes gases [6]. In Emphysematous cystitis, gases are formed not only in the bladder but also in the prostate, periurethral tissues, and scrotum [7].

The risk factors are diabetes mellitus, bladder outlet obstruction, recurrent urinary tract infection, urinary stasis, neurogenic bladder, immunosuppression, female sex, and being a transplant recipient [1,3-5]. However, emphysematous infections may occur in the urinary tract even in DM patients without glycosuria, patients where DM is well controlled or patients without DM [8].

Clinical conditions are diverse; patients may have no symptom, may have pneumaturia or report irritative voiding symptoms or acute abdomen with severe sepsis may appear. Patients with emphysematous cystitis, 7% were asymptomatic and were diagnosed incidentally on abdominal imaging for other diseases [3].

The most commonly reported organism is *E. coli*. Other pathogens known to be associated with *Aerobacter aerogenes*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Clostridium perfringens*, *Proteus mirabilis*, *Nocardia species*, and *Candida albicans* [9,10].

Emphysematous cystitis is solely diagnosed by radiologic evaluation. Emphysematous cystitis could be diagnosed through abdominal plain radiographic films in 84% of all cases [3,6]. Although emphysematous cystitis can be easily diagnosed through CT scans but an important role of CT scans is to judge the degree of progression of the disease [5].

Emphysematous cystitis therapy is implemented through short-term and long-term broad-spectrum antibiotics [11]. If there is fungal infection, antifungal agents will be helpful [5]. In patients with urinary retention and neurogenic bladder, the bladder should be kept at rest by continuous catheter drainage [12,13]. If patients do not respond to drug treatment, surgical treatment such as partial cystectomy, cystectomy, or surgical debridement should be considered [3]. If initial treatment is delayed, systemic infection, expansion of urethra and renal parenchyma infection, bladder rupture or even death may occur [14]. While Chong *et al.* reported that they successfully treated three emphysematous cystitis patients with urinary drainage and antibiotics therapy [15], Hu *et al.* reported the death of an emphysematous cystitis patient accompanied by bladder rupture [16].

In this case, although appropriate antibiotics therapy was implemented and surgical management was considered thereafter, better treatment could not be implemented due to the occurrence of unexpected complications. In the case of emphysematous cystitis, early diagnosis and treatment are a key to successful treatment.

Summary

Emphysematous cystitis is an uncommon infection of the bladder by gas-producing microorganisms. Increased suspicion should lead physicians to obtain more detailed medical histories of patients and to refer the patients for more appropriate imaging screening. Prognosis can vary from full recovery to death. Early detection and treatment of emphysematous cystitis is important, to avoid the potential morbidity and mortality associated with this infection.

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