

Emphysematous Cystitis

Emphysematous cystitis is characterized by gas collection within the bladder wall and lumen. We report two cases of emphysematous cystitis of the urinary bladder in a 67-year-old and a 63-year-old women. They presented with bladder irritation symptoms such as dysuria, hematuria and frequency. Urinalysis showed pyuria. Cystoscopic examination revealed that bladder mucosa was studded with vesicles varying in size and arranged in clumps. CT scans of the pelvis showed mottled gas bubbles within the bladder. They were treated with antibiotics. Four days after the treatment, the symptoms subsided and plain abdominal film showed no evidence of gas shadows in the pelvic cavity.

Key Words : Bladder; cystitis emphysematous; Toriography, X-ray computed

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INTRODUCTION

Emphysematous cystitis is a rare inflammatory condition of the urinary bladder, characterized by gas filled vesicles in the urinary bladder wall and often with gas in the bladder lumen (1). Emphysematous cystitis is frequently associated with glycosuria and evidence of urinary tract infection, which is often recurrent (1). Plain radiography of the pelvis and CT scan have been useful methods for diagnosing this condition. We present two cases of emphysematous cystitis with intramural gas and an air fluid level in the bladder lumen on CT scan.

CASE REPORT

Case 1

A 63-year-old woman was admitted to our hospital with diarrhea, vomiting, anorexia and weakness. She had been treated with extended pyelolithotomy and extracorporeal shock wave lithotripsy because of bilateral renal stones. She was under treatment for diabetes mellitus with oral hypoglycemic agent for 8 years, and one month prior to admission she had had a history of herpes zoster on her back. On admission, her vital signs were stable. Laboratory tests showed leukocyte $7,590/\text{mm}^3$, hemoglobin 11.9 g/dl, hematocrit 35% and platelet $189,000/\text{mm}^3$. Blood chemistry tests showed blood urea nitrogen (BUN) was 16 mg/dl, creatinine 1.6 ng/dl, sodium 134

mmol/L, potassium 4.6 mmol/L, total protein 4.6 g/dl, albumin 2.7 g/dl, fasting blood sugar 219 mg/dl. Urinalysis showed normal findings without pyuria.

Her diabetes was controlled with regular insulin. Ten days thereafter, the patient felt much better. But 12 days later, she suddenly complained of dysuria, gross hematuria, frequency and lower abdominal pain. Her blood pressure was 90/60 mmHg, body temperature 39°C , pulse rate 106/min and respiratory rate 16/min. Laboratory tests showed leukocyte $17,380/\text{mm}^3$, BUN 16 mg/dl creatinine 2.2 mg/dl, sodium 129 mmol/L, potassium 5.0 mmol/L and fasting blood sugar 191 mg/dl in the blood. Urinalysis showed specific gravity 1.005, albumin 30 mg/dl, glucose negative, red blood cells above 30 and white blood cells 5 to 10 per high power field (HPF). Culture of the urine did not reveal any specific organisms.

Abdominal erect film showed curvilinear gas shadows along the wall of urinary bladder suggesting emphysematous cystitis (Fig. 1).

CT scan of the pelvis showed diffuse thickening of the urinary bladder wall and mottled gas bubbles within it. Intravesical gas produced an air-fluid level, suggesting pneumocystitis (Fig. 2). Cystoscopy was performed. The bladder mucosa was studded with vesicles varying in size and arranged in clumps. The walls of the vesicles were thin and reflected the light of the cystoscope.

She was treated with antibiotics. Three days later the symptoms subsided and plain abdominal film showed no evidence of gas bubbles in the pelvic cavity.



Fig. 1. Erect abdomen film shows a curvilinear gas shadow along the entire wall of the urinary bladder (arrows).

Case 2

A 67-year-old woman presented with epigastric, and right flank pain and dyspnea for several months. She had been admitted to another hospital because of acute cholecystitis and multiple gall bladder stones 2 years pre-



Fig. 3. Pelvic ultrasonogram shows arc-shaped high echogenicities (arrows) with posterior shadowing in non-dependent portion of the urinary bladder, suggesting gas bubbles.

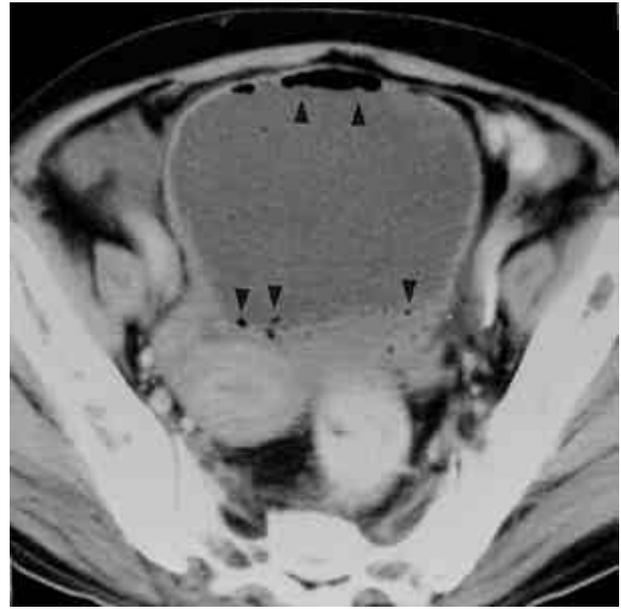


Fig. 2. Postcontrast pelvic CT scan shows mottled gas bubbles within the wall of the bladder (arrow heads).

viously. She refused cholecystectomy. She also had been treated for pulmonary tuberculosis 10 years previously.

On this admission, her vital signs were stable. She was lethargic but arousable. Laboratory tests were as follows; hemoglobin 13.6 g/dl, leukocyte 11,270/mm³, hematocrit 42.7% and platelet count 300,000/mm³. Blood chemistry tests were creatinine 0.8/dl, BUN 22 mg/dl and fasting blood glucose 71 mg/dl. Urinalysis showed red blood cells 1 to 5 and white blood cells many per HPF. *E. coli* was isolated from the culture of clean voided urine. Pulmonary function test showed a combined pattern of severe obstruction and severe restriction.

Chest PA showed a severely damaged left lung suggestive of longstanding pulmonary tuberculosis. Plain abdomen showed mottled gas collections along the dome of the urinary bladder, mimicking large bowel gases. There was a 3 cm. sized lamellated calcific nodule in the right pelvic cavity.

Cystoscopy revealed many vesicles had thin walls and looked like a bunch of grapes. Pelvic sonogram showed arc-shaped highly echogenic spots with irregular posterior shadowing in the dome of the urinary bladder (Fig. 3). Pelvic CT scan showed diffusely thickened urinary bladder wall containing gas bubbles along the entire bladder wall and a high density stone in the right distal ureter (Fig. 4). She was treated with antibiotics.

A follow up urinalysis three days after treatment showed red blood cells 0 to 1 and white blood cells 0 to 1 per HPF and cystoscopy revealed marked improvement.

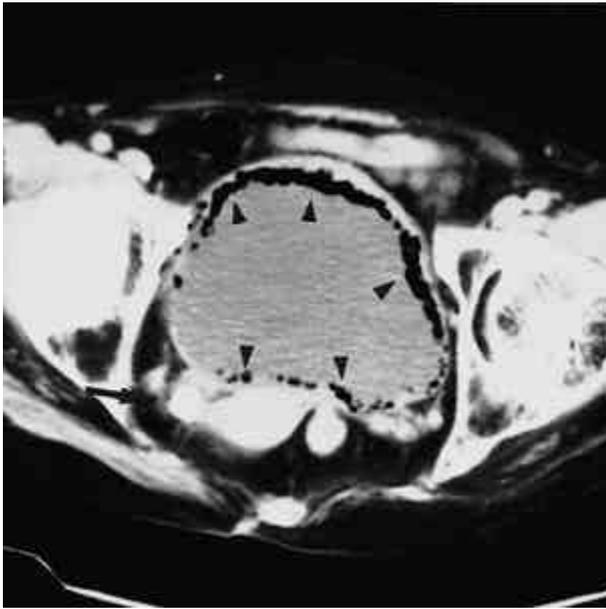


Fig. 4. Postcontrast pelvic CT scan shows numerous gas bubbles along the entire wall of the urinary bladder (arrow heads) and right distal ureteral stone (arrow).

DISCUSSION

Emphysematous cystitis is the presence of gas vesicles in the wall of the bladder. The causes of gas within the bladder are instrumentations, presence of a fistulous connection between bladder and bowel, and spontaneous formation of gas. Gas of emphysematous cystitis is thought to be formed spontaneously within the bladder wall (1). It should be distinguished from pneumaturia by the use of instruments in the genitourinary tract and fistulas between bladder and bowel, vagina, or skin.

Emphysematous cystitis has been reported in patients with diabetes mellitus, glycosuria and recurrent urinary tract infection (2). Other associated conditions are hematologic malignant conditions, neurogenic bladder, and gangrenous cholecystitis (3-5). *E. coli* is the most commonly isolated microorganism and other pathogens have included *Aerobacter aerogenes*, *Staphylococcus aureus*, *Proteus*, *Candida albicans* and *Clostridium perfringens* (3-6). One can be misled by a sterile aerobic urine culture if the etiologic agent is an anaerobic pathogen (3). Aerobic and anaerobic cultures are required for identification of the etiologic agents (7). One of our patients (case 1) had diabetes and an urinary tract infection and the other case (case 2) had a right ureteral stone and urinary tract infection by *E. coli*. Both patients had had debilitated general medical conditions such as herpes zoster (case 1) and severely decreased pulmonary function (case 2). The

proposed mechanism is a bacterial fermentation in a hyperglycemic or hyperglycosuric environment with production of gas, resulting in deposition of gas within the bladder wall (7).

Clinical findings of emphysematous cystitis are symptoms of lower urinary tract infection such as frequency, dysuria, gross hematuria and lower abdominal pain (8). But the usually mild and nonspecific symptoms and varied clinical findings make the diagnosis of emphysematous cystitis difficult unless there is a high degree of suspicion (7). Pneumaturia is not always present. Radiologic diagnosis of emphysematous cystitis is based on the detection of gas within the bladder wall. On plain abdominal film, localized clusters of gas filled vesicles are noted in the pelvic cavity which are sometimes difficult to distinguish from adjacent bowel gas or pneumatosis intestinalis (gas within bowel wall).

As the emphysematous cystitis progresses, a ring of gas surrounds the bladder partially or completely. Urography obscures the characteristic radiolucency of gas-filled vesicles when the bladder filled with contrast materials. Ultrasonogram shows diffuse thickening of the bladder wall associated with some irregular echogenic foci with posterior irregular showing, characteristic of gas bubbles (9). Intravesical gas may develop pneumocystitis and gas extension into the perivesical space, ureter, renal pelvis can rarely be seen. CT scan can accurately reveal the location of gas, within the wall, in the lumen and extravascular gas collection (2, 10). The prognosis is uniformly favorable if the process is diagnosed and treated promptly (2-7). The treatment of emphysematous cystitis is by controlling glycosuria, glycosemia and treatment with systemic antibiotics (1). If these treatment fails, surgical debridement or external drainage is required (2-3).

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