PHOTO QUIZ

Bubbles in the urinary bladder

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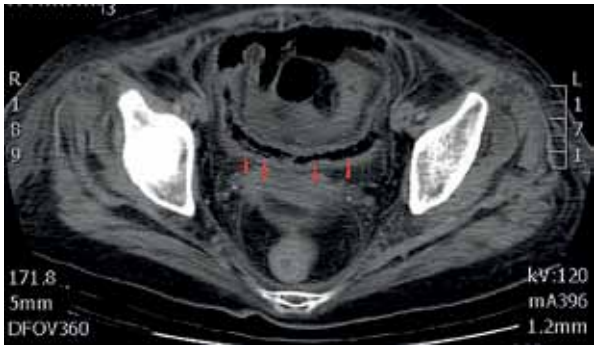
A 51-year-old woman with a recent history of intestinal strongyloidiasis, hyperthyroidism, and diabetes mellitus presented with consciousness disturbances and septic shock. At our intensive care unit, palpation of the lower abdominal area revealed a firm baseball-like mass. Acute urinary retention was considered, and the patient was catheterised with a Foley catheter. The effluent consisted of bloody urine with a large amount of air inside the drain bag. The results of laboratory evaluation revealed a white blood cell (WBC) count of 24,570 cells/mm^3 made up of 63% segmented and 28.5% band neutrophils, a haemoglobin level of 9.7 g/dl, and serum creatinine level of 1.1 mg/dl. Urinalysis showed numerous red blood cells and 5 to 10 WBCs/µl. Computed tomography (CT) images showed multiple air densities within the urinary bladder wall (*figure 1*).

Figure 1. *After Foley catheterisation, abdomino-pelvic CT images revealed both intravesicular gas formation and a characteristic mottled 'cobblestone' appearance of radiolucency within the thickened urinary bladder wall (arrowheads)*



What is your diagnosis?

See page 46 for the answer to this photo quiz.

ANSWER TO PHOTO QUIZ (PAGE 42)

BUBBLES IN THE URINARY BLADDER

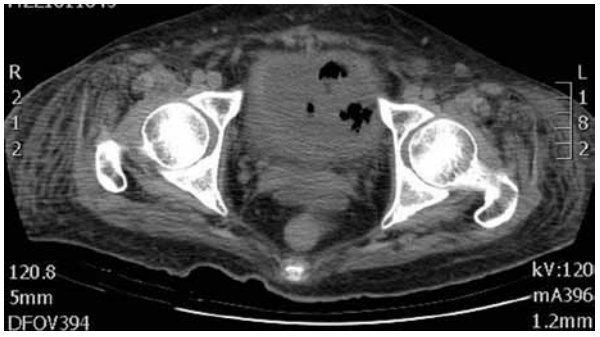
DIAGNOSIS

To treat the septic shock, empirical antibiotics, namely, piperacillin with tazobactam, were immediately administered. Both blood and urine cultures eventually yielded *Escherichia coli*. Ten days later, the residual air was found to have diminished dramatically on follow-up abdominopelvic CT (*figure 2*). Considering the initial presentation and the entire therapeutic course, emphysematous cystitis was diagnosed. The Foley catheter was then removed successfully, and the patient subsequently regained normal urinary function.

Emphysematous cystitis, first described by Bailey in 1961,[1] is a rare clinical condition in which pockets of gas are formed in and around the bladder wall by gas-forming organisms.[2] Patients with diabetes,[3] neurogenic bladder, compromised immune status, and chronic urinary infection are predisposed to the disease, especially if there is an obstruction of the urethra or cervix. Women are affected twice as often as men.[4] The pathological mechanisms of gas formation in emphysematous cystitis are a matter of debate, and bacterial fermentation of either glucose (in diabetic patients) or albumin (in non-diabetic patients) to carbon dioxide is widely hypothesised.[5] Among the organisms reported in the recent literature, *E. coli* is the most prevalent pathogen.[4] The main symptoms of emphysematous cystitis vary widely, ranging from painless gross haematuria to fulminant sepsis. Pneumaturia is rarely observed, but its presence in such patients effectively facilitates the diagnosis of emphysematous cystitis.[6]

First-line imaging modalities, including intravenous urography or abdominal plain films, can usually confirm the diagnosis, which characteristically shows curvilinear or mottled areas of increased radiolucency in the region of the urinary bladder, separate from the more posterior rectal gas.[7] Intraluminal gas presents as an air-fluid level that changes with the patient's position and, when adjacent to the nondependent mucosal surface, may have a cobblestone or 'beaded necklace' appearance.[8] This finding reflects the irregular thickening produced by submucosal blebs as seen by direct cystoscopy.[9] On the other hand, bladder sonography commonly demonstrates diffuse bladder wall thickening with increased echogenicity. CT provides the advantage of early detection of intraluminal or intramural gas[10] and a more accurate delineation of the extent and severity of emphysematous cystitis. Other causes of intraluminal gas can also be differentiated by CT, such as enterovesical fistula formation from adjacent bowel carcinoma or inflammatory disease.[11] Cystoscopy is useful for differentiating gas in the bladder secondary to an enterovesical fistula; however, it is rarely necessary for the diagnosis of emphysematous cystitis. If gas is identified in the bladder, the differential diagnosis should include the following: enterovesical fistula (caused by diverticulitis, Crohn's disease, or rectosigmoid carcinoma) and recent urinary tract instrumentation.[12]

Figure 2. *Ten days later, a follow-up CT image showed disappearance of the intramural air and dramatically diminished air density within the urinary bladder*



Treatment of emphysematous cystitis depends on early broad-spectrum antibiotics, drainage of the bladder, and glycaemic control.[2] The initial antibiotic choice should focus on aerobic and anaerobic pathogens — even including potential fungal infections. Urinary drainage with a urethral catheter usually suffices to reduce the pathogen burden directly within the bladder. Rarely, surgical debridement is needed if an abscess develops outside the bladder.[2] Treatment of hyperglycaemia will decrease glycosuria — the bacterial substrate for gas formation. Although the prognosis in patients diagnosed and treated early in the disease process is usually favourable, this disease is potentially fatal.[4] The development of emphysematous ureteritis, nephritis, or adrenalitis heralds a poor prognosis.[2] In patients with uncontrollable necrotising infections, combined medical and surgical interventions are warranted, such as partial or total cystectomy and nephrectomy for emphysematous pyelonephritis.

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