Emphysematous cystitis and sepsis: a case report

Anis Aziz, MD, Alain Maillette, MD
Department of Urology, Centre Hospitalier Régional de Trois-Rivières,Trois-Rivières, Quebec, Canada

AZIZ A, MAILLETTE A. Emphysematous cystitis and sepsis: a case report. The Canadian Journal of Urology. 2008;15(3):4118-4121.

Emphysematous cystitis is a rare disease that is usually caused by aerobic bacteria. The clinical course can vary from asymptomatic cystitis to fulminant sepsis. We present a case of a 68-year-old man with emphysematous cystitis with sepsis where early diagnosis and conservative treatment led to a favorable outcome.

Key Words: emphysematous, management, cystitis

Case report

A 68-year-old man was discharged from the hospital to return to his nursing home after a 1-month admission for a fractured clavicle. Five days later, he was readmitted after a fall; he had abdominal pain that had lasted for 5 days and also had oliguria.

Accepted for publication May 2008

Address correspondence to Dr. Anis Aziz, 4430 rue Le Monelier, Quebec, Qc, Canada G1H 2P1

His medical history revealed he had advanced diabetes mellitus, which had been diagnosed 15 years earlier; he also had retinopathy. He had chronic renal failure and had started hemodialysis treatment 5 years ago. He also had atherosclerotic vascular disease, coronary artery disease, a myocardial infarction 5 years earlier, and cardiac insufficiency with an ejection fraction of 45%. The patient also had chronic obstructive pulmonary disease. His medications consisted of aspirin, Folvite, Lipitor, Monopril, Motilium, Norvasc, Novolin, Pantoloc, Renagel, and Rocaltrol. He had no known allergies. He did not use alcohol or tobacco.

At admission, the patient's physical exam showed a pulse rate of 115 BPM, an arterial pressure of 90/52 mm Hg, and a temperature of 38.6ºC. He had suprapubic-abdominal pain.

Laboratory test results showed a white blood cell count of 12.3/mm^3 with 89% neutrophils, and a hemoglobin level of 9.4 g/dl. His serum glucose was 8.6 mmol/L (155 mg/dl). His urinalysis showed a pH of 6.5, specific gravity of 1.015, positive nitrites, RBC > 100/HPF, WBC > 100/HPF and abundant bacteria/HPF. A computerized tomography (CT) scan of the abdomen and pelvis showed a distended bladder 14 cm x 20 cm, a fluid-air level, and air within the bladder wall, Figure 1.

The patient was diagnosed with emphysematous cystitis and admitted to the intensive care unit. His bladder was decompressed with a Foley catheter and he was started on ciprofloxacin and Flagyl the same day. On the following day, March 29, a cystoscopy was performed which revealed that the patient's bladder had a thickened wall filled with bubbles. On March 30, the patient had a temperature of 39.2ºC. He was started on Ceftriaxone. Urine and blood culture tests revealed growth of E. coli that was sensitive to all antibiotics. On April 3, the patient's WBC count had decreased to 9.7/mm^3 and he had had a normal temperature for the 3 past days. Treatment with Ceftriaxone was stopped but ciprofloxacin and Flagyl were continued for a total

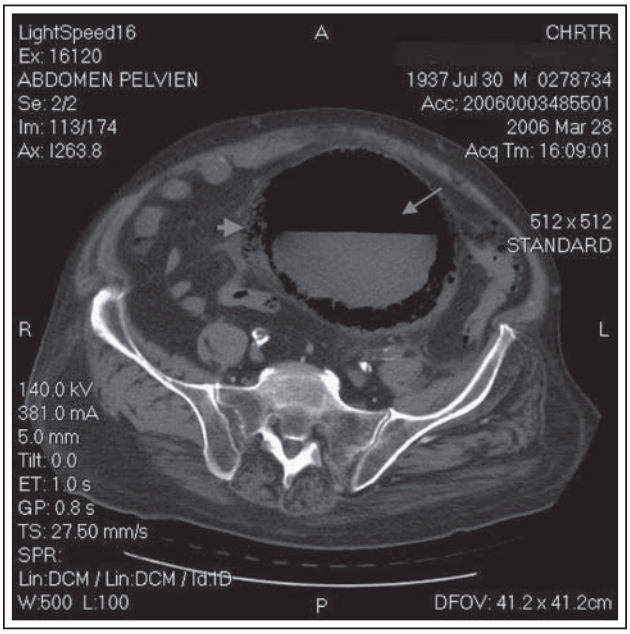

Figure 1. The abdominal CT scan shows an air-fluid level (bold arrow) and air within the bladder wall (thin arrow).

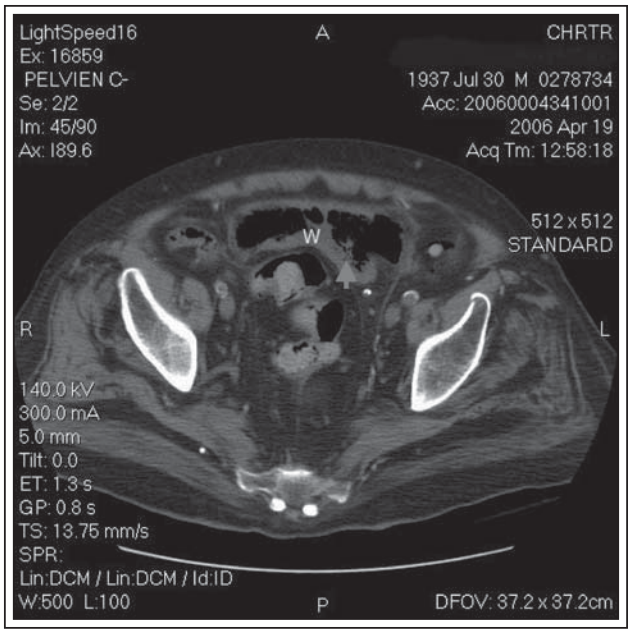

Figure 2. CT scan shows a thickening of the bladder wall (W) with air within the wall (bold arrow).

of 21 days. On April 4, a second CT scan revealed no deterioration since the earlier CT scan. Cystoscopy performed on April 6 showed a re-epithelialization of the bladder wall with lots of debris. Cystography performed on April 12 did not show any enterovesical fistula. The patient's Foley catheter was removed on April 18. The next day, the patient was re-infected with an enterococcus bacterium that was sensitive to ampicillin, and he was treated with amoxicillin for 7 days. A CT scan done on April 19 showed a residual thickening of the posterior wall with air on that wall, Figure 2. The patient had further leg ischemia, and amputation under the knee was performed on May 7. He had diarrhea with C. difficile on June 20, which resolved, and he was discharged at the end of June. No further imaging tests were done following the resolution of the patient's urinary symptoms. Urinary catheter weaning was not possible because the patient had an atonic bladder due to his diabetes. Currently, the patient has asymptomatic bacteriuria and is being followed at 6-month intervals.

Comments

Emphysematous cystitis is a rare disease that has been reported in 132 case reports. This pathology was first described in 1671 in a patient who "passed wind in the urethra".[1-3] It was subsequently described in autopsies done in the 1800s.[3,4] Ravich and Katzen reported the

first premortem case in 1932[5] and Antoine performed the first cystoscopic diagnosis in 1934.[6,7]

Emphysematous cystitis is defined as a "bacteriuria accompanied by gas in the bladder lumen or wall or both".[7] It is a rare form of acute infection of the bladder mucosa and the underlying musculature that is caused by gas-forming organisms. Typically, E. coli is involved in emphysematous cystitis, but other organisms such as Enterobacter aerogenes, Staphylococcus aureus, Streptococci, Klebsiella pneumoniae, and Proteus mirabilis may also be involved.[8-11] It can be more difficult to make the diagnosis if the patient has a sterile urine culture due to involvement of anaerobic pathogens such as Clostridium perfringes or Candida, as reported in some case reports.[1,11]

Several risk factors have been associated with emphysematous cystitis. More than 50% of patients with this disease have been reported to have diabetes mellitus. Glucose in the urine is presumed to be substrate for the fermenting action of gas-forming aerobes; the gas is thought to consist of carbon dioxide and nitrogen.[12-14] Other risk factors include urinary tract obstruction, neurogenic bladder, chronic urinary tract infections, and indwelling urinary catheters. Emphysematous cystitis has been reported in some patients with hematologic neoplasm who are immunosuppressed.[1,15]

Clinical symptoms of dysuria, irritative symptoms and hematuria are frequent. Pneumaturia may occur. Untreated emphysematous cystitis can progress to necrotizing cystitis and bladder perforation with possible peritonitis and sepsis. The clinical course may deteriorate to emphysematous ureteritis, nephritis, and death.[15,16] The patient's physical exam may show an abdominal tenderness with possible vesical globe. Urinalysis often shows microscopic or macroscopic hematuria, glucosuria, ketones, nitrites, leucocytes, pyuria, and bacteriuria. Urine culture identifies the involved organism. Sterile urine should also be examined to detect non-routine organisms such as anaerobes and yeasts.[1,15]

In patients with emphysematous cystitis, computerized tomography is very sensitive in detecting gas in the intraluminal and intramural bladder. It may also show other sources of intraluminal gas such as enteric fistula from bowel carcinoma, diverticula, or inflammatory bowel disease, and vaginal fistula. Conventional radiography shows curvilinear or mottled areas of increased radiolucency on the region of the urinary bladder described as a "beaded necklace"; intraluminal gas may be seen as an air-fluid level that may change with patient position. Ultrasonography may show a diffuse bladder wall thickening and increased echogenicity.[12,15] Cystoscopic findings are described as "numerous tiny gas bubbles embedded in a shaggy redness of the bladder wall".[17-19] Some authors noticed that these bubbles ruptured easily and gave off a silvery-light reflection.[9,18,19]

Treatment of emphysematous cystitis includes control of underlying diabetes, if present; giving a broad-spectrum antibiotic initially and an organism-targeted antibiotic; establishment of urinary drainage; provision of required medical supportive care; exclusion of a bladder fistula and, if necessary, surgical debridement.[1,15,20,21]

According to the case reports, most patients with emphysematous cystitis have good outcomes, and the bladder often regains its normal function. Conservative management can be successful even in the presence of sepsis.[1,15,20,21]

Conclusion

Emphysematous cystitis is a rare form of complicated cystitis that may occur in diabetic or immunosuppressed patients. The diagnosis is made by imaging tests. Early diagnosis and treatment with bladder decompression and an antibiotic will permit a favorable outcome, as seen in our case. Delay in diagnosis can lead to necrotizing cystitis with bladder perforation or fistula that warrants surgical intervention. □

References

1. Greene MH. Emphysematous cystitis due to Clostridium perfringens and Candida albicans in two patients with hematologic malignant conditions. *Cancer* 1992;70:2658-2663.
2. Perlmutter AE, Mastromichaelis M, Zaslau S. Emphysematous cystitis: a case report and literature review. *W V Med J* 2004;100:232-233.
3. Raiborski. Exemple de pneumaturie ou d'urine gazeuse chez une maladeaffectée de névropathie protéiforme avec prédominence de symptômes de l`hypocondrie. Annus Secondus. 1671:85 Miscellanea Curiosica Decuria Prima, 263-264. 1860. Gaz d Hop Paris.
4. Eisenlohr W. Das interstitielle vagina, darm und harnblasenemphysem zuruckgefuhurt auf gasentwickelnde bakterien. *Beitr Path Allg Path* 1888;3:101.
5. Ravich A, Katzen P. Cystitis emphysematosa:review of the litterature with report of an authentic case terminating in recovery. *JAMA* 1932;98:1256-1259.
6. Antoine T. Zurklinik der cystitis emphysematosa. *Zentralbl Gynakol* 1934;58:2230-2235.
7. Fowler EJ Jr. Urinary Tract Infections and inflammation. Year Book Medical Publishers, 217-219. 1989. Chicago.
8. Bartkowski DP, Lanesky JR. Emphysematous prostatitis and cystitis secondary to Candida albicans. *J Urol* 1988;139:1063-1065.

9. Bailey H. Cystitis emphysematosa; 19 cases with intraluminal and interstitial collections of gas. *Am J Roentgenol Radium Ther Nucl Med* 1961;86:850-862.
10. Wayland JS, Kiviat MD. Clostridial cystitis emphysematosa. *Urology* 1974;4:601-602.
11. Singh CR, Lytle WF Jr. Cystitis emphysematosa caused by Candida albicans. *J Urol* 1983;130:1171-1173.
12. Grayson DE, Abbott RM, Levy AD, Sherman PM. Emphysematous infections of the abdomen and pelvis: a pictorial review. *Radiographics* 2002;22:543-561.
13. Joseph RC, Amendola MA, Artze ME, Casillas J, Jafri SZ, Dickson PR, Morillo G. Genitourinary tract gas: imaging evaluation. *Radiographics* 1996;16:295-308.
14. Daly JJ Jr. Alderman DF, Conway WF: General case of the day. Emphysematous pancreatitis. *Radiographics* 1995;15:489-492.
15. Walter S, Mogensen P, Jacobsen GK. Gangrenous cystitis. A case report. *Scand J Urol Nephrol* 1981;15:73-74.
16. Quint HJ, Drach GW, Rappaport WD, Hoffmann CJ. Emphysematous cystitis: a review of the spectrum of disease. *J Urol* 1992;147:134-137.
17. Katz DS, Aksoy E, Cunha BA. Clostridium perfringens emphysematous cystitis. *Urology* 1993;41:458-460.
18. Ellenbogen PH, Talner LB. Uroradiology of diabetes mellitus. *Urology* 1976;8:413-419.
19. Hawtrey CE, Williams JJ, Schmidt JD. Cystitis emphysematosa. *Urology* 1974;3:612-614.
20. McCallum DC. Gangrene of the bladder with subsequent regrowth. *J Urol* 1965;94:669-670.
21. Shah MS, Nabong R, Rogin A, Zarif A, Javadpour N, Sassoon H, Bush IM. Sequestration of the total bladder mucosa caused by clostridial infection. *J Urol* 1973;110:54-56.

EDITORIAL COMMENT

The authors present an interesting case report of emphysematous cystitis that was treated conservatively with a favorable outcome. The patient had typical findings on CT scan including bladder wall thickening with air present in the bladder wall. A more cost effective diagnostic test is a conventional abdominal plain film x-ray which may reveal the presence of gas outlining the bladder wall.

While this patient did have a positive urine culture for E. coli, one must also consider anaerobic or fungal pathogens. Because of the wide spectrum of pathogens implicated in this condition, treatment with broad spectrum antibiotics providing coverage for gram positive, gram negative, anaerobes and fungal species are recommended.

Control of glucosuria in the diabetic patient with emphysematous cystitis is also important. Glucose in the urine may be a substrate for the process of fermentation by gas-forming bacteria. This may further exacerbate the inflammatory response.

Stanley Zaslau, MD, MBA, FACS
Program Director
Associate Professor
Division of Urology
West Virginia University
Morgantown, West Virginia, USA