
CASE REPORT

Emphysematous Cystitis Complicated by Urinary Bladder Perforation: A Case Report

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ABSTRACT

Emphysematous cystitis is a rare serious complication of urinary tract infection characterised by gas formation in the wall or lumen of the urinary bladder due to bacterial fermentation. We report a case of an 86-year-old female with emphysematous cystitis complicated by anterior bladder wall perforation. Her urine grew *Escherichia coli* and imaging showed gas collection inside the urinary bladder and outside the ruptured anterior bladder wall. She was treated with antibiotics and bladder irrigation and responded well without surgery. Early diagnosis and treatment improve the outcome, hence the importance of a high index of suspicion.

Keywords: Emphysematous cystitis, *Escherichia coli*, Urinary bladder perforation, Urinary tract infection

INTRODUCTION

Emphysematous cystitis (EC) with bladder wall perforation is a rare but potentially life-threatening complication of urinary tract infections. EC is characterised by gas collections within the bladder wall or its lumen¹, typically affecting middle-aged diabetic women. Other risk factors are alcoholism², undernutrition³, advanced age, debility, urinary outflow tract obstruction, structural abnormalities of the bladder and indwelling urinary catheters⁴. It is caused by gas producing organisms, *Escherichia Coli* (*E coli*) being the predominant infecting organism (58%) followed by *Klebsiella pneumoniae* (21%); *Clostridium spp* (7%) and *Enterobacter spp* (7%)⁵. Prompt diagnosis and treatment are warranted to prevent morbidity in this rare entity.

CASE REPORT

An 86-year-old Chinese woman presented with a two-day history of vomiting, constipation and lethargy. She had no fever, urinary symptoms or any abdominal pain. She had no past medical problem until two months prior to this present illness when

she was admitted for acute cholecystitis due to common bile duct calculus. She underwent sphincterotomy and biliary stenting and was discharged after one week. She was re-admitted one month later with abdominal discomfort and was found to have uncomplicated lower urinary tract infection due to *Klebsiella pneumoniae* for which she was treated with ciprofloxacin and discharged after three days.

On examination, her temperature was 37°C, pulse 108 beats per minute, and blood pressure was 134/76 mm of Hg. She was noted to be dehydrated. Heart sounds were normal and lungs were clear. Abdomen was soft, non-tender with a palpable urinary bladder up to umbilicus. Renal punch was negative.

Laboratory tests showed: Haemoglobin 13.5 g/dl, total white count 17×10⁹/L, platelet count normal, urea 22.5 mmol/L, sodium 117 mmol/L, potassium 4.1 mmol/L, chloride 83 mmol/L, creatinine 311 µmol/L. Serum amylase was not elevated. CRP was



Fig. 1. Plain Radiograph of the Abdomen

The plain abdomen radiograph shows gas within the lumen of the urinary bladder (black arrowheads). The area of mottled radiolucencies above the right superior pubic ramus appears to be gas in the vesical wall (black arrows).



Fig. 2. Axial Contrast Enhanced CT Image

The axial CT scan image shows marked thinning and breakdown of the anterior wall of the urinary bladder (black arrowheads). There are multiple gas locules in the perivesical inflammatory fluid collection consistent with severe emphysematous cystitis (black arrows).

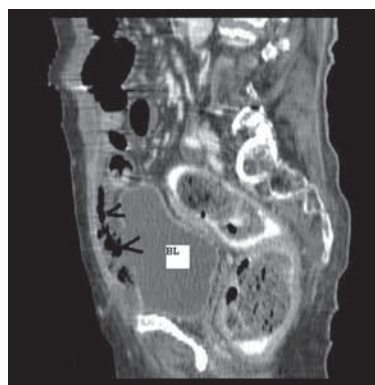


Fig. 3. Sagittal Reconstructed CT Image

The sagittal CT scan image shows the relationship of the anterior perivesical fluid collection with multiple gas locules (black arrowheads). The breakdown of the anterior wall of the urinary bladder is well-illustrated.

high at 351 mg/L. UFEME displayed RBC 93/UL, WBC 245/UL and epithelial cell 3/UL. Urine culture grew *E Coli*. Blood culture grew *Enterococcus faecalis*. The abdominal radiograph showed gas within the urinary bladder wall and in its lumen (Fig. 1). Computed tomography (CT) scan image showed marked thinning and breakdown of the anterior wall of the urinary bladder with multiple gas locules in the perivesical inflammatory fluid collection consistent with severe emphysematous cystitis (Figs. 2 and 3).

She was treated with antibiotics, intravenous rehydration and bladder irrigation. The anterior urinary bladder wall perforation was managed

conservatively with close monitoring and serial CT imaging to determine the progression. She made a gradual recovery. Urea, electrolytes, creatinine, CRP and total white count reverted to normal within a few days. Her stay was complicated by mechanical intestinal obstruction due to constipation which resolved. Prior to discharge, the patient and family were educated on bladder training and were advised on measures to avoid constipation to prevent urinary tract infection (UTI) and its complications.

DISCUSSION

Clinical features of EC are non-specific. Patients may be asymptomatic or have symptoms of lower

urinary tract infection such as frequency, dysuria, urgency, gross haematuria and lower abdominal pain⁶. Rarely may they experience pneumaturia. Most cases are diagnosed using plain films of the abdomen. However since the gas shadow may be difficult to distinguish from adjacent bowel gas, CT is now the primary imaging method for diagnosis. Early diagnosis and management consists of parenteral antibiotic therapy, bladder drainage and control of diabetes (if present). In about 10% of cases, surgery may be necessary. Hyperbaric oxygen has also been described in rapid resolution of a case⁷.

In a review of 135 cases of EC by Thomas AA and colleagues, the median patient age was 66 years, there were more women (64%) and 67% had diabetes mellitus. Most cases were diagnosed using plain films of the abdomen (84%) and the overall death rate was 7%⁶.

In another review of the literature by Grupper M and colleagues, they found that 62.2% of the patients were elderly diabetic women and that classic symptoms of UTI were present in only 53.3% of cases. Abdominal tenderness and haematuria were noted in 65.6% and 82.3% of cases, respectively. Plain abdominal x-ray was highly sensitive (97.4%), while abdominal CT was the most sensitive and specific diagnostic tool⁸.

The exact mechanism of gas formation in emphysematous infections is unclear. It is presumed to be due to the presence of aerobic gas forming organisms like *enterobacteriaceae* that rapidly ferment glucose and produce carbon dioxide⁹ and in non-diabetic patients, it has been proposed that urinary lactose or tissue proteins may serve as substrates for the gas formation⁸.

Urinary bladder wall perforation as a result of EC is extremely rare. A Pubmed search showed four case reports, two of which were due to non-albicans candida species related EC and required surgery^{10,11}. The organisms in the other two cases were *E coli* and early conservative treatment with appropriate antibiotic and bladder irrigation avoided surgery^{12,13}. Non-albicans candida species related EC and bladder rupture probably warrants surgery when compared to other causative organisms such as *E coli*.

Our patient had no symptoms of urinary tract infection but had a distended palpable bladder and diagnosis was made on abdominal radiograph and confirmed by CT. She was an elderly patient with no history of diabetes and no other disabling illness. However she had a sphincterotomy and biliary stenting two months before and this may have contributed to her condition as she apparently remained frail and probably had chronic urinary retention since the procedure. This may explain her previous UTI and current bladder perforation in the presence of EC. Interestingly, her blood and urine culture grew different bacterial species, but both *E coli* and *Enterococcus faecalis* are bowel/genitourinary tract in origin. *Enterococcus faecalis* bacteremia may arise from mechanical intestinal obstruction. There was no CT evidence of vesicointestinal fistula which suggested that the anterior urinary bladder wall rupture was due to severe infection. Bladder drainage is an important part of the management of EC even when perforation is not present. In our case, surgery was avoided with prompt medical treatment.

The prognosis of EC is favourable if the process is diagnosed promptly and treated properly. However the clinical course may be severe evolving to urinary bladder rupture and emphysematous pyelonephritis that could necessitate surgical procedures such as nephrostomy or the removal of a kidney¹⁴. Bladder irrigation is needed if blood clots are present or the patient cannot adequately void. The duration of antimicrobial therapy depends upon clinical response⁸.

CONCLUSION

EC with bladder rupture is an uncommon complication of UTI that may have grave consequences if not diagnosed and treated early. There are no classical clinical features and hence a high degree of suspicion is essential, especially in elderly and diabetic patients. Further diagnostic imaging is highly recommended in patients with UTI who present with abdominal pain and haematuria or with worsening renal function. Resultant urinary bladder rupture from EC can be managed conservatively with prompt and appropriate antibiotics and bladder drainage if the causative organism is *E coli*, however, non-albicans candida EC induced bladder rupture probably warrants early surgery.

REFERENCES

1. Quint HJ, Drach GW, Rappaport WD, Hofmann CJ. Emphysematous cystitis: A review of the spectrum of disease. *J Urol* 1992;142:134–7.
2. O'Connor P, Davies M, Feely J. Emphysematous cystitis — another alcohol-related problem? *Ir Med J* 1987;80:420–1.
3. Ebe T, Oshima H, Takeda N, Matsumoto T. Emphysematous cystitis developed in a patient with an eating disorder and schizophrenia. *J Infect* 2003;47:260–1.
4. Petersen RO. *Urologic pathology*. Philadelphia: JB Lippincott. 1986:308.
5. Gupta S, Koirala J, Khardori R, Khardori N. Infections in Diabetes Mellitus and Hyperglycemia. *Infectious Disease Clinics of North America*. 2007;21(3):617–38.
6. Thomas AA, Lane BR, Thomas AZ, Remer EM, Campbell SC, Shoskes DA. Emphysematous cystitis: A review of 135 cases. *BJU Int* 2007;100(1):17–20.
7. McCabe JB, McGinn Merritt W, Olsson D, Wright V, Camporesi EM. Emphysematous cystitis: rapid resolution of symptoms with hyperbaric treatment: a case report. *Undersea Hyperb Med* 2004;31(3):281–4.
8. Grupper M, Kravtsov A, Potasman I. Emphysematous cystitis: illustrative case report and review of the literature. *Medicine (Baltimore)* 2007;86(1):47–53.
9. Weedle J, Brunton B, Rittenhouse DR. An unusual presentation of emphysematous cystitis. *Am J Emerg Med* 1998;16:664–6.
10. Comiter CV, McDonald M, Minton J, Yalla SV. Fungal bezoar and bladder rupture secondary to candida tropicalis. *Urology* 1996;47(3):437–41.
11. Anestad O, Eilard T. Severe candida cystitis with perforation of the urinary bladder. *Scand J Urol Nephro* 1997;31:311–2.
12. Togo Y, Yasuda K, Suzuki T, Yamamoto H, Kokura K. A case of emphysematous cystitis: a case report. *Hinyokika Kyo* 2006;52(11):879–81.
13. Banon Perez VJ, Garcia Hernandez JA, Valdelvira Nadal P, Nicolas Torralba JA, Server Pastor G, Coves R, et al. Intraperitoneal bladder perforation in emphysematous cystitis. *Actas Urol Esp* 2000;24(6):501–3.
14. Hoepelman AIM, Meiland R, Geerlings E. Pathogenesis and management of bacterial urinary tract infections in adult patients with diabetes mellitus. *Int J Antimicrob Agents* 2003;22:35–43.