CASE REPORT

Emphysematous cystitis: a tympanic bladder

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SUMMARY

An 86-year-old woman with type 2 diabetes was admitted with increasing lethargy and hyperglycaemia. On examination she was noted to have a tender and tympanic bladder. CT revealed a distended bladder with gas locules in the bladder wall. She was diagnosed with hyperglycaemic hyperosmolar non-ketosis precipitated by emphysematous cystitis. After systemic antibiotics and bladder drainage via a urethral catheter, her symptoms readily improved. Radiographic appearances of the bladder were normal one week after instigating treatment. Emphysematous cystitis is characterized by gas within the bladder wall. Although rare it is increasingly more recognized with the advent of modern imaging. The mainstay of treatment is antibiotics and bladder drainage. Rarely surgical debridement and even cystectomy is required.

BACKGROUND

Emphysematous cystitis is an unusual and under recognised condition which requires early diagnosis to reduce its high associated mortality.^{1 2} With the advent of CT there has likely been an increase in diagnosis. We present a typical case of emphysematous cystitis with classical CT findings.

CASE PRESENTATION

An 86-year-old woman was admitted after collapsing at home. Her medical history included type 2 diabetes, vascular dementia and recurrent urinary tract infections. The patient's son reported that she had been increasingly lethargic over the prior 3 days. He had also recently noted her to have fetid urine. On direct inquiry the patient denied dysuria, fever or abdominal pain. On examination the patient was found to be mildly confused, her heart rate was 100, temperature 37°C and she had a tender, palpable and tympanic bladder. The rest of the examination was normal.

INVESTIGATIONS

Blood glucose was found raised at 40.3 mmols and urinalysis was positive for leucocytes, nitrites, glucose and blood. White blood cell count was $4 \times 10^9/l$, CRP was 30 mg/l and creatine was raised at 174 $\mu\text{mol/l}$. A recent urine culture had grown *Escherichia coli*. In the light of her abdominal tests' findings, a CT scan of the abdomen and pelvis was performed. This revealed a distended bladder with gas locules within the bladder wall (figure 1).

DIFFERENTIAL DIAGNOSIS

The diagnosis was hyperglycaemic hyperosmolar non-ketosis precipitated by emphysematous cystitis.

Figure 1 CT showing a thickened bladder wall containing gas locules.

TREATMENT

Treatment consisted of catheterisation, intravenous fluids and insulin infusion. She was also started on the antibiotics metronidazole and amikacin, which was at a reduced dose based on renal function. After catheterisation, pneumaturia and a residual volume of 520 ml was noted.

OUTCOME AND FOLLOW-UP

Following bladder drainage and antibiotics her symptoms steadily resolved and radiological appearances of the bladder were improved as found on a follow-up CT scan 1 week later (figure 2). She was discharged 2 weeks after admission with a long-term catheter.

DISCUSSION

Emphysematous cystitis (EC) is characterised by intraluminal and intramural gas within the bladder.¹ *E coli* is the most common causative organism, others include *Klebsiella pneumonia*, *Enterobacter aerogenes*, *Proteus mirabilis*, *Staphylococcus aureus*, *Clostridium perfringens* and *Candida albicans*.²

Figure 2 CT 1 week after antibiotics and catheterisation, showing resolution of intramural gas within the bladder.

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Female sex, diabetes mellitus, an immunocompromised state, recurrent urinary tract infections and urinary stasis from neuropathy or outlet obstruction are all well-recognised risk factors.¹ EC has also been observed postrenal transplant in a diabetic patient.³ The pathogenesis of gas forming infections is poorly understood. In patients with diabetes, high tissue and urinary glucose are thought to provide a substrate for carbon dioxide production via fermentation. Urinary albumin and lactose have been proposed as equivalent substrates in patients who are non-diabetics.²

There is a spectrum of clinical presentations; pneumaturia, haematuria, dysuria and abdominal pain can be present and there may be severe sepsis.⁴ Features are often inconclusive, however, with 7% of patients recorded as asymptomatic in a 2006 review of reported cases by Thomas *et al.*² Resultantly, EC is typically a radiological diagnosis and with the increasing use of abdominal and pelvic imaging, there has been a parallel rise in reported cases. Direct visualisation of the bladder through cystoscopy, laparoscopy and laparotomy can also provide the diagnosis.² Differentials for gas within the urinary tract include surgical instrumentation, trauma and vesicoenteric fistulas secondary to colorectal carcinoma, diverticular disease, radiation therapy or Crohn's disease. The history in tandem with imaging is usually sufficient to exclude these aetiologies. Related gas-forming infections within the urinary tract include emphysematous pyelonephritis, emphysematous pyelitis and gas-forming renal abscesses.⁵

Historically, EC was perceived as a grave diagnosis with cystectomy viewed as the only chance of cure. Treatment is now primarily based on antibiotics and bladder drainage with combined management of other interrelated disorders such as diabetes. Surgery is only warranted in severe cases where medical management is unsuccessful or in the presence of spreading, necrotising infections. This includes partial cystectomy, cystectomy and debridement. Hyperbaric oxygen has also been proposed as a possible adjuvant to aid resolution.⁶ Compared with emphysematous pyelonephritis, where death rates can be near 50%, EC has a better prognosis with quoted death rates around 5–10%.^{2 4} Nevertheless, early recognition and treatment is essential to prevent necrotising infections and spread to the upper urinary tract.

Learning points/take home messages

- ▶ Emphysematous cystitis (EC) is likely under diagnosed and it is imperative to consider it in patients with diabetes and other risk factors presenting with unresolving cystitis or pneumaturia.
- ▶ Diagnosis and characterisation are best achieved with CT scan.
- ▶ Medical treatment with antibiotics and bladder drainage is usually sufficient but in severe cases surgical intervention may be required.

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Competing interests None.

Patient consent Obtained.

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