

A case of emphysematous cystitis

一個氣腫性膀胱炎的個案

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Emphysematous cystitis (EC) is an uncommon but potentially life-threatening urinary tract infection. Diagnostic difficulty exists because of the variable presentations. We report the case of a 73-year-old woman who presented with diarrhoea and malaise, and emphysematous cystitis was revealed on the abdominal X-ray. As she was treated for EC, the diarrhoea and the radiographic abnormalities of EC also resolved. The evaluation and management of this complicated urinary tract infection are discussed. (*Hong Kong j.emerg. med.* 2008;15:148-151)

氣腫性膀胱炎是不常見但有潛在生命威脅的泌尿道感染。診斷上存在困難是由於變化不定的徵狀。現報告一名73歲女子呈現腹瀉及渾身虛弱的個案，腹部X光顯露氣腫性膀胱炎。當以氣腫性膀胱炎治療時，腹瀉及放射照片上氣腫性膀胱炎的異常亦消退。本文並討論這複雜泌尿道感染的評估及處理。

Keywords: Cystitis, diabetes complications, diabetes mellitus, urinary tract infections

關鍵詞：膀胱炎、糖尿病併發症、糖尿病、泌尿道感染

Introduction

Emphysematous cystitis (EC) is an uncommon complicated lower urinary tract infection that is typically found in diabetic females.¹ Diagnosis may be difficult because of the non-specific presentations. Early diagnosis and prompt institution of treatment (urinary drainage and broad spectrum antibiotic) will definitely reduce the mortality rate.

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Case presentation

A 73-year-old lady was brought to our department in August 2005 because of diarrhoea and malaise for two days. She had passed moderate amount of watery stool for several times each day. She had neither vomiting nor abdominal pain. She had no recent travel history. Her medical history was significant for diabetes mellitus and hypertension. Currently she was on glibenclamide, metformin, indapamide and perindopril. She could manage her daily living before attending our department. On presentation, she was fully conscious but looked dull. The oral temperature was 37°C. The blood pressure was 133/61 mmHg. The pulse rate was 90 beats per minute. She was mildly dehydrated. The abdomen was soft and non-tender. There was no focal neurological deficit. Haemoglucostix was 15.3. She was admitted to the medical ward for further management.

The initial blood tests revealed the following findings: white blood cell count (WBC) $15.00 \times 10^9/L$ with neutrophil $10 \times 10^9/L$, sodium 108 mmol/L, potassium 3.3 mmol/L, urea 10.5 mmol/L, creatinine 77 $\mu\text{mol/L}$, random sugar 14.2 mmol/L and the liver function was normal. Hyponatraemia and hypokalaemia were corrected with normal saline, sodium chloride tablet and potassium chloride syrup. The sodium level was 115 mmol/L on day 2. The rise of sodium level was 7 mmol/L within 14 hours. The initial urine culture was negative. The stool was negative for ova and parasites.

On day 3, her Glasgow Coma Scale (GCS) dropped to 6/15. Urgent computed tomography (CT) brain showed no gross lesion. Lumbar puncture was performed and the results were normal. As shown in Table 1, the renal function was impaired with urea 14.8 mmol/L and creatinine 224 $\mu\text{mol/L}$ in the morning of day 3 (08:48 h). The WBC was markedly elevated (Table 2). At Day 3 (19:52 h), the level of urea and creatinine further increased to 20.6 mmol/L and 308 $\mu\text{mol/L}$ respectively. A pelvic mass was palpated on abdominal examination at that time. Urgent ultrasonography of kidneys was performed that showed bilateral hydronephrosis and a large lesion (12.3 x 8.7 x 9.4 cm) with echogenic border and hypoechoic centre in the pelvic region. Subsequently, X-ray of kidney, ureter and bladder (KUB) showed curvilinear area of radiolucency

delineating the urinary bladder wall (Figure 1). The diagnosis of emphysematous cystitis was then confirmed. Haematuria was noted when a catheter was inserted for urinary drainage. The subsequent urine culture yielded *Escherichia coli*. On the same day, she was put on piperacillin with tazobactam (Tazocin) and antifungal (fluconazole) after consultation with microbiologists.

By day 4, the diarrhoea resolved. The renal function and GCS were improving and normalised on day 5 and 6 respectively. The KUB repeated on day 9 showed disappearance of the emphysematous cystitis. On day 10, she was switched to ceftibuten (Cedax). Her subsequent hospital stay was uneventful and she was discharged home on day 12. The levels of electrolytes and renal function on discharge were normal.

Discussion

Emphysematous cystitis (EC) is an uncommon and complicated urinary tract infection characterised by gas formation in the bladder. The disease is associated with diabetes mellitus and other conditions such as diverticulitis, Crohn's disease and carcinoma of the rectosigmoid colon as these are related to fistula formation.¹ It has a female predominance with a female-to-male ratio of 2:1.² Besides, non-infectious

Table 1. Renal function and electrolyte profiles

	Day 1 17:14	Day 2 07:14	Day 3 08:48	Day 3 19:52	Day 4 18:08	Day 5 08:52	Normal range
Sodium	108	115	121	124	133	136	136-148 mmol/L
Potassium	3.3	2.6	3.1	3.5	3.4	3.3	3.6-5.0 mmol/L
Urea	10.5	7.7	14.8	20.6	17.2	10.8	3.8-10.7 mmol/L
Creatinine	77	65	224	308	132	79	45-82 $\mu\text{mol/L}$

Table 2. White blood cell count of the patient

	Day 1	Day 3	Day 5	Day 10	Normal range
White blood cell	15.00	28.90	15.20	10.10	4.40-10.10 $\times 10^9/L$



Figure 1. KUB revealing curvilinear area of radiolucency delineating the urinary bladder wall (arrows).

causes such as bladder instrumentation or catheterisation induced trauma should be considered.³ Our patient had the risk factors of being a female, diabetic patient and advanced age.

The pathogenesis of emphysematous cystitis is still uncertain. It is postulated that the combination of gas-producing organisms, high tissue concentration of glucose and impaired tissue perfusion may contribute to the development of EC.⁴ In diabetic patients, the blood and serum interstitial fluid glucose level is high due to poor glycolysis. Diabetes mellitus can also lead to vasculopathy, thus impairing the circulation. Impaired immunity in diabetic patients also favours the development of emphysematous cystitis. Other risk factors include neurogenic bladder and bladder outlet obstruction as these can cause urinary stasis.⁵ Fermentation of glucose by bacteria via various pathways results in carbon dioxide production inside the urinary bladder.⁶ Gas-producing bacteria, such as *E. coli*, *Klebsiella* and *Enterobacter* species are frequently isolated. *Clostridium*, in contrast to what we might think of the classical gas-producing organism, is only

occasionally identified.⁷ Other pathogens include *Pseudomonas*, *Proteus*, *Streptococcus*, *Enterococcus*. Fungal species such as *Candida* are occasionally isolated.

The clinical presentation varies. Thomas et al reported that 7% of the patients with EC were asymptomatic and were diagnosed incidentally on abdominal imaging for other diseases.⁸ In a recent review article, Grupper et al reported that classical symptoms of urinary tract infection e.g. dysuria, frequency or urgency were present in only 53.3% of the patients with EC.⁶ Some atypical presentations were reported that included "decreased general condition", diarrhoea, acute abdomen, and sepsis etc.⁶ Chong et al reported three cases of EC presenting with typical clinical and radiological features of acute abdomen.³ The more specific symptom is the presence of pneumaturia but it is rare.⁷ Our patient first presented with diarrhoea and malaise that subsequently resolved once she responded to treatment. However, the pathophysiological relationship between EC and diarrhoea is unknown.⁹

Emphysematous cystitis can be easily diagnosed with imaging tools. The classical KUB film shows a radiolucent line delineating the bladder wall with or without intraluminal air.^{7,8} Intraluminal air-fluid level will change with patient's position. CT scan is a more accurate diagnostic tool that can detect this disease at an early stage and assess the severity as well.⁷ In addition, CT scan can find out the causes of emphysematous cystitis such as fistula and adjacent carcinoma.

The mainstay of treatment of EC includes bladder drainage, appropriate antibiotics and control of the underlying conditions.^{6,8} Control of hyperglycaemia will decrease glucosuria and thus decrease the substrate for fermentation and gas production. Surgical treatment is often not necessary unless it is associated with other gas forming conditions such as emphysematous pyelitis or emphysematous pyelonephritis. Although EC is largely a benign condition, one of the papers quoted its overall mortality

to be 7%, whereas it may be as high as 50% for emphysematous pyelonephritis.¹⁰ Thus early recognition and aggressive treatment is of paramount importance to avoid fatality and surgery.

Conclusion

We report a case of emphysematous cystitis with unusual presentations. As EC is uncommonly encountered in our daily practice and it may be associated with significant mortality, emergency physicians should be aware of such disease entity and the variable presentations.

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