

LETTERS TO THE EDITOR

CASE REPORTS

Emphysematous cystitis and pyelonephritis leading to a diagnosis of type 2 diabetes in an older patient

Dear Editor,

Emphysematous urinary tract infection is rare, while the co-occurrence of emphysematous pyelonephritis is even more exceptional. We report a case of an older patient without regular medical follow-up presenting with a combination of emphysematous cystitis and pyelonephritis that led to a diagnosis of underlying type 2 diabetes mellitus (DM).

An 88-year-old man was admitted to the emergency unit of our hospital with delirium and shivering. His past medical history was unremarkable. On examination, the patient was confused, hemodynamically stable and not febrile. He exhibited bilateral pitting oedema up to the thighs, decreased cardiac sounds and breathing sounds at lung bases. There was also a suprapubic tenderness with dullness on percussion. An enlarged prostate without exacerbated pain on touch was found during the rectal exam. The rest of the examination was unremarkable. Blood analysis at hospital admission showed a non-fasting blood sugar level of 8.4 mmol/L, a normochromic, normocytic anaemia (Hb 130 mg/L), no leucocytosis and an elevated C-reactive protein level of 17.6 mg/L. Levels of creatinine and urea were also elevated up to 411 μ mol/L and 33 mmol/L, respectively. eGFR was 10 mL/min/1.73 m², and the total amount of carbon dioxide was 17.4 mmol/L. Urine analysis showed a leucocyturia (7537 leucocyte/mm³) associated with a non-glomerular haematuria (481 red cells/mm³). An ultrasound scan showed the presence of air in the bladder. Therefore, a non-contrast computed tomography (CT) scan was performed, which revealed extensive intramural air in the bladder wall progressing up to the left kidney with a dilated left ureter and perinephric infiltration (Fig. 1). The bladder was partially filled up with fluid. This was suggestive of emphysematous cystitis and pyelonephritis. The urologist's opinion was that there was no indication to perform drainage with nephrostomy as diuresis was preserved. In order to monitor the urine output and to treat the urinary retention, a perurethral 16 Fr Folley catheter was inserted. Purulent urine was drained after catheterization. Ciprofloxacin was started immediately and was rapidly switched to imipenem for 10 days following results of the urine culture collected at hospital admission and positive within the first 24 h for growth of an extended-spectrum beta-lactamase producing *Escherichia coli*. The two sets of blood cultures collected were negative. The patient was then moved to the intensive care unit for monitoring. This conservative treatment was successful, with clinical improvement and regression of the radiological diagnoses on follow-up CT. A trial without catheter was unsuccessful, with recurrence of urine retention, leading to long-term catheterization. Subsequently, type 2 diabetes mellitus was confirmed with a glycated hemoglobin level of 8.4%, associated with micro- and

macrovascular complications. The patient was later diagnosed with heart failure with reduced ejection fraction, sensorimotor polyneuropathy and chronic kidney disease with a persistent eGFR between 10 and 13 mL/min/1.73 m². During the acute and post-acute phases, we observed hyperglycemia varying from 8.6 to 12.5 mmol/L for fast blood glucose and from 14.2 to 17.8 mmol/L for post-prandial glucose. Optimal glycemic control was achieved with an intermittent short-acting insulin regimen, which was then transitioned to longer-acting insulin. Moreover, blood markers of inflammation continued to rise within the first 48 h of imipenem and then finally began to decrease after 96 h of treatment, followed by clinical improvement.

Emphysematous urinary tract infection (EUTI) is a rare and potentially life-threatening condition. EUTI is typically observed in older women (60–70 years old), with DM being the most notable risk factor for this condition,^{1,2} while acute renal function impairment, proteinuria, changes in mental status and shock are related to poor prognosis.^{3–7} The infection is caused by various bacteria, with *Escherichia coli* being the most prevalent (more than half of the described cases) in urine cultures. The presence of gas-forming bacteria with high glucose levels in the urinary tract and impaired host response are believed to prompt the development of EUTI.⁶

Clinical presentations are variable (from asymptomatic to severe sepsis) and usually non-specific (abdominal pain, gross haematuria, dysuria, fever). Diagnosis of EUTI is made in patients with complicated urinary tract infections who underwent imaging assessment by abdominal ultrasound or CT.³ The use of imaging techniques is probably associated with the increasing reports of this disease. As the gold standard technique, CT assesses the extent of the infection from gas confined in the collecting system only to extensive bilateral emphysematous pyelonephritis.⁸ Early treatment with antibiotics, bladder drainage and management of comorbidities are required to avoid complications such as bladder rupture or septic shock,⁹ with only a minority of cases requiring surgery.

Patients with diabetes have increased susceptibility to pathogens and subsequent infections. Underlying mechanisms include impairment of cytokine production, defects in phagocytosis and dysfunction of immune cells. Therefore, infections in this population are associated with increased incidence of complications, length of treatment and cost of care.¹⁰

This case highlights that DM should be screened for in patients presenting with EUTI, as well as the importance of appropriate imaging, an early diagnosis and fast introduction of antibiotic treatment.

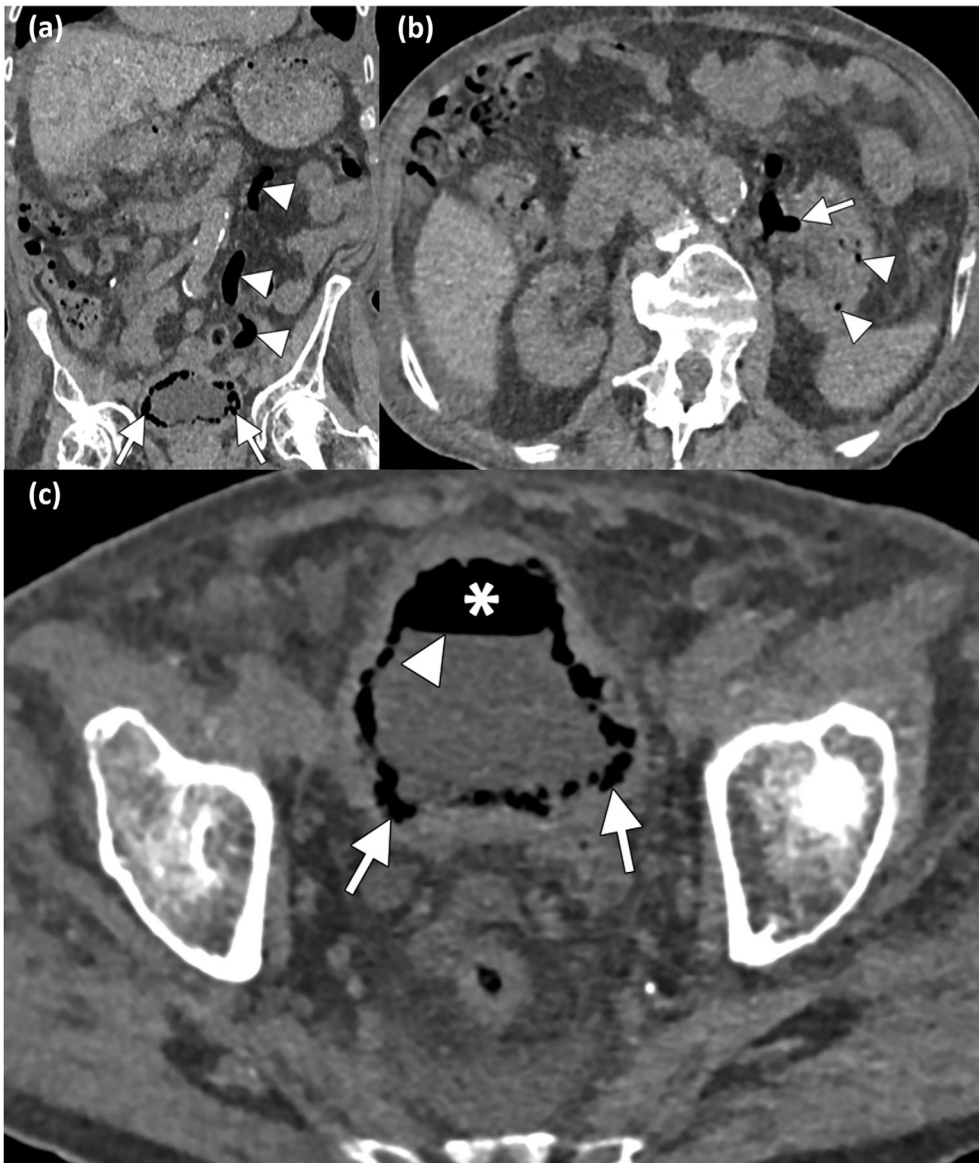


Figure 1 Coronal oblique (a) and axial oblique (b) reconstructions of non-contrast-enhanced abdominal computed tomography (CT) show intramural air in the bladder wall (a, arrows), an air-filled dilated left ureter (a, arrowheads), air in the left pelviclyceal system (b, arrow), and small air bubbles within the left renal parenchyma (b, arrowheads). (c) An axial image of non-contrast-enhanced abdominal CT shows intraluminal air (c, asterisk) in the more anterior portion of the bladder, with associated air-fluid level (c, arrowhead). Note the extensive intramural air (c, arrows).

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Disclosure statement

The authors have no conflicts of interest to declare.

Data availability statement

The data that support the findings of this case report are available from the corresponding author, upon reasonable request.

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Urgent renal replacement therapy and pacemaker implantation in a 98-year-old man

Dear Editor,

An aging society poses an ethical dilemma when it comes to the initiation of dialysis. Crude mortality rates preceded by dialysis withdrawal increased from three per 1000 person-years in 1966 to 48.6 per 1000 person-years in 2010.¹ It is extremely difficult to adjudicate renal replacement therapy (RRT) in older adult patients with acute kidney injury (AKI) in an emergency. Herein, we report the case of an older male adult who recovered from life-threatening hyperkalemia with complete atrioventricular block due to urgent RRT and permanent pacemaker implantation.

A 98-year-old man with hypertension and chronic kidney disease presented to our hospital with faintness. He had been using azilsartan 20 mg and azelnidipine 16 mg per day for hypertension, which was diagnosed more than 30 years ago. Chronic kidney disease was estimated to be hypertensive nephrosclerosis with a creatinine level of 1.40 mg/dL because of slowly progressive kidney function impairment with normal urine sediment and bilateral renal atrophy. His basic and instrumental activities of daily living (ADL) were independent of his daughter, who was a key person for him. His nutritional status was assessed by examining his body mass index, which was stable at 21.9 kg/m², and albumin level, which was 3.7 g/dL. He took an apple, three kiwi fruits and a cup of vegetable juice every day, in addition to three meals per day. On admission, his Eastern Cooperative Oncology Group performance status was 1. His pulse rate was 34/min with complete atrioventricular block on electrocardiography. Laboratory findings revealed elevated levels of creatinine and potassium at 2.31 mg/dL and 7.6 mEq/L, respectively, with normal urine sediment. Computed tomography revealed no evidence of urinary tract obstruction. He was diagnosed with hyperkalemia and complete atrioventricular block caused by excessive intake of potassium and adverse effects of azilsartan. During the explanation of his condition, his heart rate decreased to 16/min with a complaint of dyspnea, which prevented him from listening to our explanation. His daughter told us that his advanced age deterred him from undergoing maintenance dialysis, although shared decision making (SDM) and advanced care planning (ACP) had not been performed. However, his daughter chose urgent RRT, observing that the patient was asking for help, even though we explained the possibility of transition to maintenance dialysis. Temporal pacemaker implantation and continuous RRT were desirable,

but even with an ambulance, the nearest hospital with cardiology and nephrology departments were an hour away. Therefore, intermittent hemodialysis for 3 h was performed twice with the administration of dopamine at our hospital, which decreased the potassium level to 4.3 mEq/L and improved his dyspnea. However, the persistence of complete atrioventricular block after hemodialysis resulted in permanent pacemaker implantation in the nearest cardiology department. His faintness disappeared with decreased creatinine level at 1.32 mg/dL without hemodialysis. Upon conducting comprehensive geriatric assessment, we found that he was motivated to join rehabilitation in addition to the full ADL. There was no sign of cognitive impairment, and his revised Hasegawa dementia scale score was 29 points. He was satisfied with the treatment and enjoyed his daily life before hospitalization.

Age is a risk factor for AKI because hypovolemia and atherosclerosis limit renal blood flow in older adults. In fact, the incidence of non-dialysis-requiring AKI is higher in older adults with advanced age.² However, the incidence of dialysis-requiring AKI decreases in patients older than 80 years of age, which implies their rejection of dialysis regardless of the need for treatment.³

The most important ethical problem in older patients with AKI is the possibility of decreasing the quality of life after urgent RRT. Thakar *et al.*⁴ reported that advanced age was associated with lower chances of discharge in patients with AKI. Furthermore, AKI accelerates the progression of chronic kidney disease in older patients, leading to maintenance dialysis.⁵ SDM and ACP should be preceded based on the information collected from patients and repeated discussions before RRT. However, it is almost impossible for patients with AKI to proceed with SDM and ACP during emergent situations and poor judgment. Collecting information on the patient's health, including comorbidities and ADL, plays an important role, particularly in an emergency. In our case, independent ADL without critical comorbidities enabled the family and us to choose urgent RRT, which clearly improved his quality of life. Liu *et al.*⁶ reported that age was not associated with mortality rates in older adult patients with AKI who required continuous RRT. If the patient does not opt for maintenance dialysis but chooses urgent RRT, a time-limited trial of RRT will justify the treatment.

In conclusion, the initiation of dialysis should not be based on age, but on the individual. RRT can be implemented in older adult patients with AKI, although routine indications for dialysis are not