Diabetes, fever, and flank pain

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A 54-year-old noninsulin-dependent diabetic woman presented with fever and left flank pain of one-month duration. She denied haematuria, gravelluria or oliguria. At presentation, she was febrile (body temperature 39°C), drowsy and dehydrated. Her pulse was 100 beats/min and blood pressure 100/70 mmHg. An indistinct tender mass was palpable in her left lumbar region. Other systemic examinations were normal. Investigations: total leucocyte count $28 \times 10^9/l$ with 80% polymorphs, blood glucose 14 mmol/l, urea 42.6 mmol/l, creatinine 342 $\mu\text{mol/l}$ and pH 7.36. Urine showed 10–15 pus cells/hpf, glucosuria (++) and ketonuria (+). Urine and blood cultures were sterile. Ultrasound-guided aspiration of the mass was carried out. The aspirate was cultured and sensitivity of micro-organisms tested. Contrast-enhanced computed tomography (CT) of the abdomen is shown in the figure.

Questions

- 1 What is the diagnosis?
- 2 What is the pathogenesis of this condition?
- 3 What are its management strategies?

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Figure Contrast-enhanced CT of the abdomen

Answers

QUESTION 1

The diagnosis is emphysematous pyelonephritis (EPN). This is evident from the gas shadows in the left renal, pelvicalyceal and perirenal regions, as shown in the figure.

QUESTION 2

EPN is most often caused by *Escherichia coli* infection.^{1,2} The mechanism of gas formation is unclear. It is postulated that diffuse renal ischaemia in an infected, diabetic kidney results in low oxygen tension which induces anaerobic metabolism; facultative anaerobes like *E coli* ferment glucose to carbon dioxide and hydrogen which appears as gas on imaging.³ On-going ischaemia and/or obstruction results in tissue necrosis which further provides substrate for gas formation.⁴

QUESTION 3

CT of the abdomen is the best imaging modality for diagnosis.⁵ A high index of suspicion, prompt evaluation, control of hyperglycaemia, effective antimicrobial therapy against Gram-negative rods and early surgical intervention (open drainage/nephrectomy) are required for the effective management of EPN.

Discussion

EPN is a rare gas-forming infection of the renal, pelvicalyceal and perirenal tissues. It occurs most often in diabetics (90%) with a female preponderance (female:male, 1.8:1).¹ The left kidney is affected more often (53%), followed by the right (40%), and 7% bilaterally.² Renal papillary necrosis is seen as a complication in 21% of cases.² EPN in non-diabetics is invariably associated with obstructive uropathy.²

Fever, nausea/vomiting, flank pain with or without abdominal mass, are the usual presenting features of EPN.³ The onset is often acute and occasionally may have an indolent course, as in our patient.² Poor clinical response, despite optimal antimicrobial therapy for 72–96 h in a diabetic with urinary tract infection, necessitates exclusion of EPN, perinephric abscess or complicating renal papillary necrosis.

Gram-negative bacilli of the enterobacteriaceae group are the most common causative pathogens, the most common being *E coli* (50–70%) followed by *Klebsiella pneumoniae*, *Enterobacter aerogenes*, *Proteus mirabilis* and *Pseudomonas aeruginosa*.^{1,2} Fungi like *Candida albicans*, *C tropicalis* and *Cryptococcus neoformans* are infrequent causes. Polymicrobial infection is seen in 14–19% of cases.^{1,2} In our patient, aspirate from the mass grew *E coli* sensitive to cefotaxime, to which she responded.

Abdominal contrast-enhanced CT is the best imaging modality for the diagnosis of

Learning points

- fever, flank pain with or without abdominal mass in a patient with diabetes mellitus should raise suspicion of EPN
- gas shadows in the renal, or perirenal region on plain X-ray or CT scan of abdomen is *sine qua non* of EPN
- effective antimicrobial therapy against Gram-negative rods, good glycaemic control, and prompt surgical intervention are the mainstay of treatment

EPN. It demonstrates the presence and precise location of gas in renal and perirenal tissues and delineates the extent of renal damage.⁵ However intravenous contrast should be used with caution in an already dehydrated patient with compromised renal function. Plain X-ray of abdomen shows gas in renal and perirenal areas in one third of patients.² In our patient, the abdominal X-ray was unremarkable while the CT scan demonstrated gas shadows in renal, pelvicalyceal and perirenal areas. Retrograde pyelography is needed when obstruction is suspected. Similarly an isotope renogram is useful in assessing and monitoring renal cortical function. Urine and blood cultures help in establishing the aetiological diagnosis. Ultrasound-guided aspiration of the renal mass is sometimes needed, as in this case.

Treatment strategies include adequate hydration, good glycaemic control and effective antibiotics including cefotaxime or ceftazidime/quinolones and aminoglycosides parenterally for two weeks followed by oral administration for two weeks. Aminoglycosides, should be used with caution and doses adjusted to renal function.

Surgery (open drainage or nephrectomy) is indicated in patients with fulminant septicaemia or failure to exhibit rapid clinical improvement and lack of resolution of gas or appearance of perinephric collection on serial radio-imaging within three to four days.³ CT-guided percutaneous drainage has been successful in localised EPN, salvaging functioning renal tissue. Our patient, who had an indolent course, responded to antimicrobial therapy, but detection of perinephric collection on serial imaging called for open drainage. Mortality in EPN with medical management alone is high (71%) but is substantially reduced to 10%, with early and aggressive surgical intervention.^{1,2}

Final diagnosis

Emphysematous pyelonephritis (left kidney) with perinephric collection of pus in a woman with diabetes nephritis.

Keywords: diabetes mellitus; emphysematous pyelonephritis; kidney

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Affective incontinence in a young adult

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A 32-year-old woman was brought by ambulance to Accident and Emergency at 08.30 h. She had been found asleep in a car by a man walking his dog at 07.00 h. There was a vacuum cleaner hose carefully connected from the exhaust through a small opening in one of the windows. When she was found, the engine had been switched off. Petrol was still present in the car indicating that at some point for some reason, accidental or otherwise, the engine had stopped working. A suicide note was found in the car possibly written between midnight and 05.00 h that morning. An ambulance picked her up at 07.20 h and started administration of 100% oxygen.

On arrival in Accident and Emergency, the patient was confused, uncommunicative and drowsy with a Glasgow Coma Score of 14. Physical examination was unremarkable and no focal neurology was elicited. Plasma carboxyhaemoglobin was within the normal range (less than 2%) and oxygen was discontinued. Routine blood tests were normal apart from a moderate leucocytosis ($17.5 \times 10^6/l$). She was admitted for observation, and transferred to a psychiatric unit for further assessment and management.

Her behaviour was grossly disturbed. In the first few days of her admission, she urinated on the floor three times, and was verbally aggressive. She remained disoriented in time and place, and demonstrated poor memory and poverty of thought content. Her speech was slurred and she answered all questions with “Don’t know”. To the question, “How many legs does a cow have?”, she answered “eight”. She was unable to read the clock, and could not reliably remember how many children she had or recognise them from photographs. She had experienced recent stressful life events – marital strife, debts of £6000, an unplanned pregnancy from a minor, temporary custody of her children by her husband, and an upcoming court case against her on a charge of GBH. She had rendered her husband partially deaf after striking him with a hammer.

Computed tomography (CT) and magnetic resonance imaging (MRI) subsequently demonstrated evidence of widespread bilateral damage to white matter around the basal ganglia. Neuropsychological testing confirmed significant deterioration in intellectual function with an IQ score of 62 and a Mini-Mental State Examination score of 16/30.

Questions

- 1 What is the most likely diagnosis?
- 2 What is the differential diagnosis?
- 3 What are the neuropsychiatric sequelae of this condition?

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