A 55-year-old female presented with gross haematuria and low back pain. Her previous medical history included type 2 diabetes mellitus and hypertension for more than 10 years. Two months earlier, she had undergone left lobectomy of the liver for intrahepatic duct stones. The post-operative course was complicated by methicillin-resistant *Staphylococcus aureus* (MRSA) bacteraemia associated with central venous catheter infection. The catheter was removed, and treatment with intravenous vancomycin was begun. Her fever gradually subsided after a 2-week course of antibiotic therapy. Cardiac auscultation did not reveal a changing murmur. Repeated blood cultures were sterile. However, she began to notice gross haematuria and low back pain with radiation to the anterior thigh of her right leg, causing her to lie with her hips flexed. Based on her past history of degenerative spine disease, non-steroidal anti-inflammatory drugs (NSAIDs) were administered for pain relief, but the response was poor. Her white cell count was 14 400/μl, with 78% neutrophils, her haematocrit was 39.9% and her platelet count was 362 000/μl. Coagulation studies, renal function tests, antinuclear antibody, hepatitis B and C serologies, ASLO, and complement C3 and C4 were all normal. Urinalysis showed 11–20 white cells and 4+ red cells per high-power field and was 100 mg/dl for protein; no erythrocyte cast was found. Urine cultures and cytology studies were negative. Analysis of urinary red cell morphology revealed 51% dysmorphic erythrocytes, suggestive of intermediate haematuria. Plain abdominal radiograph was negative for urinary stones. Renal ultrasound and intravenous urography (IVU) were unremarkable. Her backache gradually worsened. Her haematuria remained unexplained. A nephrologist was asked to see the patient for her haematuria.

### Questions

- What is the cause of her macrohaematuria? What further physical examination would be helpful?
- What investigations would confirm your diagnosis?
- How would you treat the patient?
Answer to the quiz on the preceding page

Although analysis of urine erythrocyte morphology could not distinguish between a glomerular and a non-glomerular source of haematuria, a disorder of the renal parenchyma is unlikely because neither heavy proteinuria nor renal function impairment is noted. Absence of urine erythrocyte casts also suggests a post-renal source of haematuria in the urinary tract. A normal IVU, however, speaks against ‘intraluminal’ causes of urinary tract haematuria. Therefore, ‘extra-luminal’ causes of haematuria should be carefully sought and ruled out. In this patient, the most important clue to the diagnosis of haematuria was the concurrent development of severe low back pain. On physical examination, her abdomen was soft without rebound, but tenderness was elicited by stretching of the psoas muscle by extension of the hip—the psoas sign, indicating irritation of the psoas muscle by an inflammatory process. In this patient, the psoas muscle was probably seeded haematogenously by infection from the central venous catheter. Anatomically, the retroperitoneally located ureters run along the anterior surface of the psoas muscles to the urinary bladder [1]. Psoas abscesses with periureteritis causing gross haematuria were strongly suspected.

Psoas abscesses usually result from spread of infection from a nearby source, such as appendicitis, diverticulitis, Crohn’s disease, urinary tract infection or perinephric abscesses, and vertebral osteomyelitis (often tuberculosis) [2]. Diagnosis is established on the basis of imaging procedures (ultrasound, CT) and culture [3]. Ultrasound of the hip revealed marked psoas muscle swelling with mixed hyper- and hypo-echoic areas (Figure 1). An enhanced CT scan confirmed the abnormality seen on ultrasound examination: within enlarged psoas muscles were hypodense centres with marginal enhancement and gas formation (Figure 2), a finding consistent with the presence of abscesses. Ultrasound-guided aspiration of both abscesses yielded purulent fluid. Culture of the fluid grew MRSA. Separate catheters were introduced into the bilateral psoas cavities. She was relieved of symptoms by drainage of the abscesses combined with intravenous vancomycin treatment for 4 weeks.

Clinically, psoas abscess is characterized by pain upon extension of the hip, and fever. Our patient was afebrile when she developed backache, but atypical presentations of infection are the rules in diabetic patients. The other atypical presentation in our patient is gross haematuria, which, to our knowledge, has not been reported to complicate psoas abscess and may cause diagnostic difficulties. A comprehensive approach to the patient with haematuria requires a complete and thorough history and physical examination. Onset of her symptoms following central venous catheter infection raises the likelihood of complications of S. aureus bacteraemia. The possibility of renal carbuncle has been virtually ruled out by sterile urine cultures and a normal renal ultrasound. Therefore, physical examination should be aimed at excluding periureteritis due to pelvic and abdominal abscesses with close anatomical association with the ureter. A positive psoas sign, as demonstrated in this case, helps to eliminate the need for unnecessary study and makes the difference between prompt and effective treatment and delayed or even inappropriate treatment.

Conflict of interest statement. None declared.
References