Learning from errors

No pain, no pathology?

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Summary

A 22-year-old girl who had a background of reflux nephropathy and urinary tract infection presented during the night with renal angle pain and vomiting. She was treated on the emergency department (ED) pyelonephritis protocol and admitted to the short stay ward. When reviewed the next morning she was asymptomatic and feeling better. It seemed likely that she would be discharged but an ED ultrasound showed right-sided hydronephrosis and some fluid between the liver and the right kidney. CT examination confirmed the suspicion of renal tract obstruction and ruptured calyx. An 8 mm calculus was found to be the cause of the pathology. Urgent urological review was organised and the system formally decompressed with a J–J stent inserted cystoscopically later that day.

BACKGROUND

Generally, it is assumed that the resolution of symptoms in patients indicates the passage of a stone. Here it is likely to have indicated the decompression of the kidney by rupture of a calyx.

The case also illustrates that ultrasound can help in the management of pyelonephritis. The previous episodes of pyelonephritis put her at high risk of a further episode and, with the symptoms and findings on urinalysis supported immediate treatment. The absence of fever and rapid resolution of symptoms meant that she was felt to have a mild and resolving pyelonephritis. Further treatment at home on oral antibiotics was intended.

Finally, this girl had longstanding renal function compromise. She was on enalapril as treatment for hypertension from a young age, further renal damage could have been disastrous.

CASE PRESENTATION

A 22-year-old woman attended the emergency department (ED). She gave a history of 6 h of right flank pain, radiating to the right hypochondrium. It was associated with nausea and vomiting. There were no symptoms of dysuria or frequency but the patient stated that the symptoms were similar to those of her previous episodes of pyelonephritis. She gave a medical history of vesicoureteral reflux. This had led to hypertension secondary to renal scarring for which she was being treated with enalapril.

INVESTIGATIONS

Urinalysis showed 70 leucocytes per microlitre but was negative for nitrites. Urinary hCG was negative.

FBC showed Hb 14.1 g/dl (11.5–18 g/dl), white blood cell count (WBC) $22 \times 10^9/l$ (4–11), U&Es sodium 139 mmol/l (133–146), potassium 4.0 mmol/l (3.5–5.3) and creatinine 105 mmol/l (49–90).

The C reactive protein (CRP) was 89 mg/l (<10)

ED ultrasound next morning showed hydronephrosis of the right kidney and a small amount of fluid in the

hepatorenal space (figures 1 and 2). Cortical thinning was noted, especially in the upper pole of the kidney.

CT scan with contrast showed right hydronephrosis and hydroureter with an obstructing 8 mm calculus at the level of the right vesicoureteric junction. Fluid was demonstrated in the pararenal space extending down the right paracolic gutter and a small amount in the pouch of Douglas. It is possible that she has ruptured a calyx. The right kidney shows areas of cortical atrophy particularly over the right upper pole but also in the inferior pole of the right kidney and in the interpolar region and upper pole of the left kidney. The history of mild renal impairment is noted and the appearances could be due to previous reflux nephropathy.

Figure 1 Longitudinal ultrasound of the right kidney showing hydronephrosis with free fluid.

Figure 2 Another longitudinal section showing hydronephrosis, thinning of the superior pole renal cortex and perirenal free fluid.

The formal Michigan State University (MSSU) microscopy showed WBC 125, red blood cell count 1, epithelial cells 33 but there was no significant growth on culture.

DIFFERENTIAL DIAGNOSIS

The patient was treated as pyelonephritis until the ED ward round the next morning when unilateral hydronephrosis was detected on ED ultrasound. Common causes of upper tract obstruction include obstructing stones and ureteropelvic junction obstruction (usually caused by intrinsic narrowing of the ureters or an overlying vessel). In young adults, the commonest cause of unilateral hydronephrosis is ureteric calculus.

TREATMENT

Overnight treatment was with intravenous gentamicin and augmentin as per hospital protocol for pyelonephritis. The gentamicin was stopped following the ED ultrasound and CT scan. A J-J stent was inserted emergently that evening to decompress the renal system with good result.

OUTCOME AND FOLLOW-UP

Good result from decompression, the patient is due to return for stone removal later.

DISCUSSION

Acute pyelonephritis is an infection of the upper urinary tract (renal pelvis and parenchyma). It is considered uncomplicated if caused by a typical pathogen in an immunocompetent patient with normal urinary tract anatomy and renal function.

The diagnosis of acute pyelonephritis depends on the evidence of urinary tract infection (UTI) from urinalysis or culture along with signs and symptoms of upper UTI (fever, chills, flank pain, nausea, vomiting and costovertebral angle tenderness). The differential diagnosis

of acute pyelonephritis is wide and includes pelvic inflammatory disease, cholecystitis, appendicitis, lower lobe pneumonia, perforated viscus and the prodrome of herpes zoster.¹ The consensus definition of pyelonephritis established by the Infectious Diseases Society of America is a urine culture showing at least 10 000 colony-forming units (CFU) per mm³ and symptoms compatible with the diagnosis. Lower counts (1000 to 9999 CFU/mm³) are of concern in men and pregnant women.

These results are not, generally, available in the ED prior to treatment where the results of urinalysis are used instead. Pyuria is present in almost all patients with acute pyelonephritis and can be detected rapidly with the leucocyte esterase test or the nitrite test. The combination of the leucocyte esterase and nitrite tests (with a positive result on either) for UTI is more specific but less sensitive than either test alone. Although white cell casts may be observed in other conditions, they are, along with other features of UTI, specific for acute pyelonephritis. Haematuria may be present in patients with cystitis and pyelonephritis.

The traditional treatment of acute pyelonephritis has been hospitalisation and parenteral administration of antibiotics. Recently, outpatient treatment has been found to be safe and effective² and the possible monetary savings have led to an increased emphasis on outpatient treatment and the use of short admissions with parenteral antibiotics given for short periods followed by oral treatment.³ The latter strategy has led to the use of ED short stay wards for parenteral antibiotic administration for a few days as in this case.

In general, patients are admitted to the ED short stay ward for parenteral antibiotics and discharged after a few days on oral antibiotics. In this case the following morning after admission the patient looked well, was afebrile and was keen to go home. Prior to discharge an ED ultrasound was performed. The images showed continuing hydronephrosis but also some thinning of the upper pole cortex and free fluid was noted in the hepatorenal angle. A presumptive diagnosis of calyceal rupture was made and a CT scan of the kidneys with contrast was organised.

The CT scan showed right hydronephrosis, hydroureter and an obstructing 8 mm calculus at the level of the right vesicoureteric junction. The right kidney was noted to have several areas of cortical atrophy, particularly over the upper pole but also over the inferior pole, the interpolar region of the right kidney and the upper pole of the left kidney. Fluid was demonstrated in the pararenal space extending down the right paracolic gutter and a small amount in the pouch of Douglas. The appearances were consistent with a ruptured calyx.

In this case the diagnosis of pyelonephritis was made on clinical grounds, partly because of repeated previous reflux and pyelonephritis. There was a raised WBC ($22 \times 10^9/l$) and 70 WBC/ μl urine but no nitrites on urinalysis. Unfortunately while a positive nitrite test is supportive of urinary infection negative tests can occur in 'low-count' UTI ($>10^5$ CFU of bacteria per ml of urine), infections caused by bacteria that do not produce nitrites (such as enterococci), short bladder dwell time, dilute urine specimens or acid urine.⁴

It can be seen that it would be easy to mistake this patient's clinical course with resolution of infection, the pain had completely resolved and the patient was quite comfortable by morning. She was also afebrile and keen to go home. Having had previous episodes of pyelonephritis that resolved with antibiotic treatment she was not keen to stay. The ED ultrasound, however, showed hydronephrosis and probable rupture of a calyx. This persuaded her to stay for further imaging. With the raised WBC and complete obstruction of the kidney it is likely that she had obstruction of a kidney with infection. Pyonephrosis, systemic sepsis and loss of a kidney are possible complications. The use of ED ultrasound was very useful in avoiding this outcome.

Imaging has often only been recommended in premenopausal female patients who fail to improve in 72 h.⁵ There is a general agreement that precontrast and post-contrast CT is the imaging study of choice to detect parenchymal abnormalities in patients with pyelonephritis that are generally missed by ultrasound but do not alter the patient's therapy. Nonetheless the low risk, relatively low expense, lack of ionising radiation and the fact that it does not require contrast material means that ultrasound still has a place, especially as a screening investigation.⁶ Recent guidelines from the European Association of Urology recommend ultrasound in all cases of pyelonephritis.⁷

While ureteric calculus is the commonest cause of hydronephrosis in young adults ureteropelvic junction obstruction should also be considered—it can present with symptoms which include back and flank pain, UTI or pyelonephritis as in this case. The pain is classically worse after drinking large amounts of fluid. Rupture of a calyx is not usually seen, but it should be remembered as a cause of intermittent hydronephrosis.⁸

There have been previous case reports of ED ultrasound showing calyceal rupture and hydronephrosis in patients presenting with renal colic symptoms.^{9–10} There are no other examples of an ED ultrasound case report showing a similar picture in an obstructed, infected renal system as in this patient. One other case has been found showing hydronephrosis detected by ED ultrasound in a patient with pyelonephritis¹¹ but there was no evidence of calyceal rupture in that case. It does, however, also illustrate the utility of ED ultrasound in management of pyelonephrosis.

Learning points

- ▶ Patients with pyelonephritis should have imaging of the kidneys.
- ▶ Improvement in symptoms by itself does not indicate that imaging is unnecessary.
- ▶ Absence of fever does not rule out pyelonephritis or an obstructed, infected calyceal system.

Competing interests None.

Patient consent Obtained.

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