CASE REPORT

Pitfalls of the duplex system: the mystery of the missing stone

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SUMMARY

A duplex ureter constitutes about 1% of the renal tract anomalies.

A 39-year-old man presented with a 4-week history of left loin pain and microscopic haematuria. Investigation with a non-contrast CT KUB revealed a 6 mm non-obstructing calculus in the left distal ureter.

Left ureteroscopy and lithotripsy was planned. However, ureteroscopy failed to identify the calculus. A double J ureteric stent was left in situ and the procedure abandoned in favour of further assessment with a CT urogram. Imaging surprisingly showed a left duplex ureter with the calculus in the non-stented ureter.

Repeat ureteroscopy noted the second ureter opening within the distal intramural part of the stented ureter. The calculus was identified and laser lithotripsy performed. A double J stent was appropriately reinserted and removed 2 weeks later.

Our case highlights the importance of contrasted imaging prior to performing ureteroscopy for calculus disease.

BACKGROUND

Of the anomalies seen within the renal tract, a duplex ureter is thought to be present in about 1% of the population and is the most common anomaly.¹

Duplication of the ureter can either be partial or complete. In partial duplication, there will be two ureters of which both will join and open with a single opening in the bladder.² In complete duplication, the ureters will have separate openings in accordance with Weigert-Meyer law. This states that the upper renal moiety will have its ureteric insertion in the bladder inferomedially to that of the lower pole moiety.

To our knowledge, there are very few case reports in the literature documenting ureteroscopy for a stone in patients with a partial ureteric duplication. Here we present an important learning point for all patients undergoing ureteroscopy for calculus disease.

CASE PRESENTATION

A 39-year-old man was referred to the urology department by his general practitioner with a 4-week history of left-sided loin pain associated with haematuria. His symptoms had not settled with three courses of different antibiotics over a 1-month period. He had reported similar pain in

the previous year and the investigations at that time were reported as normal.

A non-contrast computed tomography of kidneys, ureters and bladder (CT KUB) was requested and showed a probable 6 mm calculus in the left distal ureter and a 2 mm calculus in the right kidney (figure 1).

Left ureteroscopy and lithotripsy of the left ureteric calculus was planned. Ureteroscopy through the normal looking left ureteric opening up to the renal pelvis failed to identify any calculus; however, a left retrograde showed only part opacification of the left pelvicalyceal system, raising the possibility of a duplex system. Therefore, a left double J stent was left in situ and the procedure abandoned for further assessment.

A postoperative CT urogram with contrast was obtained. The contrasted study revealed a duplex collecting system on the left side with the partially occlusive calculus being noted in a non-stented distal ureter. Decision was then made to do a further ureteroscopy and lithotripsy at a later date (figures 2 and 3).

Repeat cystoscopy showed a normal looking left ureteric opening. However, on repeat ureteroscopy using a 6/7.5 french semirigid ureteroscope another ureteric opening was noted just within a few millimetres (<5 mm) inside the left ureteric orifice. The opening of the duplex ureter containing the calculus was negotiated by the side of a 0.035 inch guidewire and the calculus was fragmented using holmium laser. A double J ureteric stent was left in situ and removed 2 weeks later with the patient making a full recovery.

DISCUSSION

A duplex ureter is the most frequently encountered renal abnormality and is seen in around 1% of the population, with females being more commonly affected.¹

The urinary system develops from the intermediate mesoderm. Around the fifth week of development, the ureteric bud begins to appear from the caudal end of the mesonephric duct. The ureteric bud grows into the nephrogenic cord, and the tissue from the nephrogenic cord surrounds the ureteric bud to form the metanephric blastema. The cells from the metanephric blastema will later form the nephrons which link to the collecting tubules. The ureteric bud itself will form the collecting system of the kidney: collecting tubules, calyces, renal pelvis and the ureter.

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Figure 1 Non-contrast CT showing a left-sided calculus in the lower ureter.

If the ureteric bud prematurely divides before penetrating the metanephric blastema, this can result in duplication of the urinary tract.³ The consequence of this could be a double kidney or a duplicated ureter and renal pelvis. The other possibility is that of a ureteric bud which arises twice and this can arise in a ureter which does not open into the bladder.⁴

Reviewing the literature, Gunawardena and colleagues reported two cases with similar clinical events to the one we present here.⁵ Both their patients had preoperative non-contrast CT imaging showing urolithiasis; however, ureteroscopy was negative. Re-imaging with contrast confirmed urolithiasis and eventually intraoperative diagnosis of a duplex system was made.

Figure 2 CT urogram showing contrast outlining a duplex system on the left.

Figure 3 Non-contrast phase on CT urogram showing a left ureteric stent and the left-sided calculus in another ureter.

Aiken and colleagues reported a case of complete duplication of the left ureter with ureteric stones in both ureters.⁶ In this case, initial ureteroscopy was difficult due to the small calibre ureters, hence ureteric stents were left in both ureters and laser lithotripsy to the stones was then carried out at a later date achieving good clearance.

In our case, the patient had a near complete duplication with both ureters joining in the intramural portion and with a single left ureteric orifice. Therefore at the initial ureteroscopy, we did not visualise any calculus. The possibilities of either the calculus migrating into the kidney or spontaneous passage prior to surgery were considered. However, the abnormal retrograde pyelogram prompted us to arrange a postoperative CT scan with contrast.

The current guidelines from the European Association of Urology (EAU) indicate that a contrasted CT scan should be obtained prior to attempting any procedure in order to remove ureteric calculi.⁷ A contrast-enhanced CT, allowing three-dimensional reconstruction of the collecting system, is also recommended in complex calculus disease.

In the UK, a non-contrast CT KUB has largely replaced Intravenous urogram for the diagnosis of ureteric calculi. With worsening resource constraints and in the interest of expediency, even subsequent ureteroscopic stone treatments are also performed

Learning points

- ▶ A duplex ureter is found in 1% of the population and this is an important anomaly which should be recognised when performing endourological procedures.
- ▶ Contrast-enhanced imaging should be obtained prior to carrying out any planned intervention for those with calculus disease as per the European Association of Urology guidelines.
- ▶ In those patients with complex calculus disease, a contrast-enhanced CT which allows for three-dimensional reconstruction of the collecting system is recommended prior to intervention for calculus disease.

without any further imaging in most centres despite clear guidelines from the EAU recommending contrast-based studies prior to endourological stone treatment. Our case highlights the need for contrast-enhanced imaging particularly in those situations where there is diagnostic uncertainty or a negative ureteroscopy.

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