Bilateral obstruction of bilaterally duplicated collecting systems requiring upper and lower moiety drainage

JO Lynch¹, A Cox¹, B Rawal¹, S Shelmerdine², N Vasdev¹, A Patel¹

¹East and North Hertfordshire NHS Trust, UK

²Great Ormond Street Hospital for Children NHS Foundation Trust, UK

ABSTRACT

A 60-year-old woman with a history of breast cancer presented with bilateral obstruction of bilaterally duplicated renal collecting systems secondary to extrinsic compression from metastatic pelvic lymphadenopathy. Bilateral JJ ureteric stents were inserted, resulting in some improvement of renal function but a failure to normalise completely. Repeat computed tomography demonstrated bilateral duplex collecting systems with persisting obstruction of the undrained moieties. Selective puncture was performed to decompress the obstructed renal moieties for bilateral nephrostomy catheter insertion. This allowed renal function to improve sufficiently for the patient to be discharged and commence chemotherapy. This is the first reported case of bilaterally obstructed partially duplicated collecting systems and it illustrates the importance of recognising anatomical variants to tailor treatment appropriately. It also highlights the important relationship between urology and interventional radiology in the management of such complex patients.

KEYWORDS

Interventional radiography – Kidney tubules – Collecting systems – Abnormalities – Urology

Accepted 6 December 2015; published online XXX

CORRESPONDENCE TO

Jeremy Lynch, E: jeremy.lynch@gmail.com

Case history

A 60-year-old woman presented with abdominal pain and acute kidney injury. On admission, urea was recorded as 15mmol/l (normal: 2.5–7.8mmol/l) and creatinine as 243µmol/l (normal: 49–90µmol/l). Five years previously, the patient had been diagnosed with invasive ductal carcinoma of the left breast (grade 3, T3 N1 M0), and had undergone a mastectomy and axillary clearance (4/14 nodes positive) followed by adjuvant chemoradiotherapy. She was otherwise independent without significant co-morbidity.

Ultrasonography identified bilateral hydronephrosis and computed tomography (CT) confirmed distal ureteric obstruction secondary to extrinsic compression by metastatic pelvic lymphadenopathy (Figs 1 and 2). CT also revealed lumbar spine metastatic disease, bilateral pleural effusions, ascites and peritoneal disease (Fig 2). Positron emission tomography CT demonstrated high uptake in the pelvic lymph nodes, consistent with local metastasis, thought to be the cause of her ureteric obstruction (Fig 3). Subsequently, bilateral JJ ureteric stents were inserted under general anaesthesia (Fig 4). During cystoscopy and retrograde ureterography, no anatomical abnormalities were identified, and the guidewires and stents passed without difficulty into the renal

Figure 1 Ultrasonography of the right (A) and left (B) kidneys showing bilateral hydronephrosis

Figure 2 Contrast computed tomography (portal venous phase) with coronal reformatting demonstrating bilateral hydronephrosis (arrows). Bilateral pleural effusions are also identifiable.

Figure 4 Abdominal radiography showing bilateral JJ stents

Figure 3 Positron emission tomography/computed tomography demonstrating high uptake from malignant lymph nodes in the pelvis (arrows)

pelvises bilaterally. Retrograde ureterography was carried out at the level of the renal pelvis and revealed evidence of hydronephrosis but no other anatomical abnormalities.

The patient's renal function improved immediately following the procedure but within days, it started to deteriorate again. Repeat CT was performed, which demonstrated bilateral duplex collecting systems. In retrospect, these could also be appreciated on previous cross-sectional imaging. JJ ureteric stents had decompressed the lower moiety of the right kidney and the upper moiety of the left kidney. The unstenated moieties, however, remained hydronephrotic (Fig 5).

Following imaging review, it was decided to proceed with bilateral nephrostomy insertion to decompress the persistently obstructed renal moieties. Under ultrasonography guidance, the upper calyx of the right kidney and the lower

Figure 5 Contrast computed tomography (portal venous phase) with coronal reformatting demonstrating JJ stents decompressing the lower moiety of the right kidney and the upper moiety of the left kidney as well as hydronephrosis of the unstenated moieties (arrows). Note the large left pleural effusion.

calyx of the left kidney were punctured selectively with an 18G three-part needle. Nephrostograms confirmed hydrourteronephrosis of the undrained moieties with the ureters uniting at the proximal third bilaterally (Figs 6 and 7). An 8.5Fr pigtail catheter was inserted over Amplatz guidewires

Figure 6 Nephrostogram of the lower moiety of the left kidney (arrow). JJ stent lies in the upper moiety.

(Cook Medical, Bloomington, IN, US) and sited in the undrained moieties with copious drainage (Figs 8 and 9). The patient's renal function improved following the procedure, with her urea dropping to 9mmol/l and creatinine to 192µmol/l.

The patient was discharged one week following nephrostomy insertion with an intention to internalise drainage with antegrade stents as a second stage procedure. A chemotherapy regime was commenced to treat the metastatic abdominopelvic disease.

Discussion

Duplex collecting systems are an anatomic variant seen in 0.7% of the adult population.¹ Complete duplication refers to distinct ureters draining the separate moieties into the

Figure 7 Nephrostogram of the upper moiety of the right kidney (arrow). JJ stent lies in the lower moiety.

bladder. In this case, the duplication was incomplete as the ureters united in the proximal third of their course (bifid ureter). Duplication arises by early division of a single ureteric bud on its way to the metanephric blastema, resulting in a duplex kidney in a common renal capsule. Partial duplication is usually found in metanephric tissue that has not separated fully. Such systems therefore often share several lobes and have overlapping collecting tubules. Duplicated collecting systems are twice as common in women as in men and unilateral duplication is six times as common as bilateral duplication.² Ureteric reflux is the most frequent complication of completely duplicated systems. However, the incidence in partial duplication is comparable with that in the normal population.

It is possible for each moiety to be obstructed individually, and common aetiologies include calculi, ureterocolices, intrinsic tumours and external obstruction. There have been reports of obstruction of unilaterally duplicated systems, with aetiologies including calculi and external

Figure 8 JJ stent lies in the upper moiety and nephrostomy in the lower moiety of the left kidney

Figure 9 JJ stent lies in the lower moiety and nephrostomy in the upper moiety of the right kidney

compression.^{3,4} It is very rare to encounter bilateral obstruction of bilaterally duplicated collecting systems. A literature search identified just one result of a patient with complete left duplication and partial right duplication with obstructing calculi on both sides.⁵ We report the first case of bilateral partial duplication and bilateral obstruction, and the first case caused by malignant external compression.

Conclusions

We describe the first case of bilateral obstruction of bilateral partially duplicated collecting systems secondary to metastatic disease. Simultaneous antegrade and retrograde drainage was required to access all four moieties using a unique combination of endourology and interventional radiology input. This case illustrates the importance of thorough imaging assessment for normal variants when

reviewing both cross-sectional imaging and retrograde examinations. Anatomical variants must be identified and require treatment tailored to each patient's anatomy. Close interspecialty management between urology and radiology certainly provides the best patient outcome in these difficult cases.

References

1. Gay SB, Armistead JP, Weber ME, Williamson BR. Left infrarenal region: anatomic variants, pathologic conditions, and diagnostic pitfalls. *Radiographics* 1991; **11**: 549–570.
2. Whitaker J, Danks DM. A study of the inheritance of duplication of the kidneys and ureters. *J Urol* 1966; **95**: 176–178.
3. Aiken WD, Johnson PB, Mayhew RG. Bilateral complete ureteral duplication with calculi obstructing both limbs of left double ureter. *Int J Surg Case Rep* 2014; **6**: 23–25.
4. Bhamani A, Srivastava M. Obstructed bifid ureteric system causing unilateral hydronephrosis. *Rev Urol* 2013; **15**: 131–134.
5. Scantling D, Ross C, Altman H. A 52-year-old male with bilaterally duplicated collecting systems with obstructing ureteral stones: a case report. *Curr Urol* 2013; **7**: 104–106.