Abstract We performed retrograde balloon dilatation (RBD) for the management of upper-pole primary ureteropelvic junction obstruction (UPJO) in an incomplete duplicated collecting system. A 19-year-old woman presented at our hospital with the chief complaints of fever and left back pain. Computerized tomography (CT) revealed left UPJO of the upper-pole with a left incomplete duplicated system. Retrograde pyelography (RP) revealed left UPJO of the upper-pole in the incomplete duplicated system. RBD was performed transurethrally under general anesthesia using a ureteral balloon catheter. After RBD, the hydronephrosis of the left upper-pole fully resolved, and the patient has been free from pyelonephritis for 2 years postoperatively.

Key words: UPJ obstruction, retrograde balloon dilatation, incomplete duplicated collecting system, upper-pole

Introduction

Duplication of the renal collecting system is the most common upper urinary tract anomaly, occurring in 0.5% of a nonselected population. Of these duplicated systems, approximately 70% are incomplete, with the rest being complete. Ureteropelvic junction obstruction (UPJO) is the most common cause of pyelocaliectasis, which occurs in approximately 1 in 1,500 births. Unlike horseshoe kidneys, duplicated systems may not be associated with an increased risk of UPJO. The combination of ureteral duplication and UPJO has been infrequently reported. We herein report a case of upper-pole primary UPJO in an incomplete duplicated collecting system.

Case report

A 19-year-old woman presented with the chief complaints of fever and left back pain in July 2014. She was diagnosed with left acute pyelonephritis and admitted to undergo antimicrobial therapy. Computerized tomography (CT) demonstrated left upper-pole UPJO in an incomplete duplicated collecting system without aberrant vessels. Drip infusion pyelography (DIP) revealed left upper-pole hydronephrosis with low-level functioning of the incomplete duplicated system (Fig. 1a). Retrograde pyelography (RP) revealed UPJO of the upper-pole in the incomplete duplicated system (Fig. 1b), and a 6 Fr double pig tail ureteral stent (INLAY OPTIMA®, C.R. Bard Inc., New Jersey, USA) was inserted, between the left upper-pole and bladder. After stent insertion, her fever subsided.

Two weeks after she was discharged, she was rehospitalized and retrograde balloon dilatation (RBD) was performed transurethrally under general anesthesia. On cystoscopy, the double pig tail ureteral stent was pulled out until 5 cm from the external urethral orifice using forceps transurethrally, and a 0.035-inch guidewire (Boston Scientific, USA) was inserted through the pig tail ureteral stent to the renal pelvis under fluoroscopy. Then, the ureteral stent was completely pulled out, a 6 Fr straight catheter (Boston Scientific, USA) was passed over the guidewire, and contrast medium was injected to fill the collecting system. A stiff Amplatz wire (Cook Inc., Indiana, USA) was inserted through the straight catheter to the upper-pole, and this catheter was exchanged for the ureteral dilation balloon catheter (Ascend® AQ® Ureteral Dilation Balloon Catheter (4mm × 4cm), Cook Inc., Indiana, USA) (Fig. 2a). The UPJ of the upper-pole was diluted using diluted contrast medium injected via an inflator (Cook Inflation Device) and

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a pressure gauge under fluoroscopy. Although waist-ing (a constriction of the balloon by the narrowed UPJ at the level of obstruction) was not seen, inflation was performed twice (Fig. 2b), and pressure levels were maintained at 10 and 15 atm for 5 min, respectively. Then, the ureteral balloon catheter was exchanged for a 7 Fr double pig tail ureteral stent. At 3 weeks postopera-tively, the ureteral stent was removed in the outpatient department.

After RBD, the hydronephrosis of the left upper-pole improved, and the patient has remained free from pyelo-nephritis. DIP revealed the improvement of left hydrone-phrosis of the left upper-pole at 1 year postoperatively (Fig. 3). The patient is being followed up by ultrasonog-

**Fig. 1** a : DIP revealed left upper-pole hydronephrosis with low-level functioning of the incomplete duplicated system.

b : RP revealed UPJO of the left upper-pole in the incomplete duplicated system.

**Fig. 2** a : Ascend® AQ® Ureteral Dilation Balloon Catheter (Cook Inc., Indiana, USA). The balloon size was 4mm × 4cm.

b : The inflation of UPJO was performed by the ureteral dilation balloon catheter.
raphy every four months, with no hydronephrosis of the left upper-pole for 2 years postoperatively.

Discussion

The UPJO of the lower-pole both with complete and incomplete duplex systems is a common cause of obstruction. This may be explained by the fact that the lower segment is anatomically the analogue of a single renal system, which usually corresponds to about two-thirds of the renal function. Ng reviewed a total of 10 cases of upper-pole UPJO, and formulated a surgical algorithm for its management. Ng stressed that the management was decided by the renal function, length of the available ureter, extrarenal or intrarenal pelvis, and obstructing band, with available options of pyeloplasty, pyelopyelostomy, pyeloureterostomy, ureterolysis with or without ureteroureterostomy, and heminephrectomy. According to Ng’s algorithm, our case should be treated by pyelopyelostomy or pyeloureterostomy.

The management of upper- and lower-pole UPJO will depend on the renal function, available length of the ureter, and associated reflux. Surgical management of lower-pole UPJO is tailored to the particular configuration in a given patient. In a complete or nearly complete duplication, lower-pole dismembered pyeloplasty is performed. If the lower-pole has a short partial duplication, the lower-pole ureter is excised up to the ureteroureteral junction, and a lower-to-upper-pole pyeloureterostomy is performed. Recently, Lowe et al. performed laparo-

scopic reconstruction for three children with lower-pole UPJO showing partial duplication. Laparoscopic surgery may also be applicable for lower-pole UPJO showing partial duplication.

In comparison, in upper-pole UPJO with incomplete duplicated systems, close attention and care are necessary to preserve the lower-pole, which controls two-thirds of the renal function. Ng reviewed a total of 10 cases of upper-pole UPJO, and formulated a surgical algorithm for its management. Ng stressed that the management was decided by the renal function, length of the available ureter, extrarenal or intrarenal pelvis, and obstructing band, with available options of pyeloplasty, pyelopyelostomy, pyeloureterostomy, ureterolysis with or without ureteroureterostomy, and heminephrectomy. According to Ng’s algorithm, our case should be treated by pyelopyelostomy or pyeloureterostomy.

Recently, Robenwolf et al. described 90 previously reported cases of UPJO showing a duplicated collecting system. Our patient with upper-pole UPJO in an incomplete duplex system is the first case to be treated successfully by RBD. The advantages of RBD as a treatment for UPJO are easy to define: first, it is simple and quick, typically taking 20-30 min. Second, RBD has a low risk of hemorrhage and minimal morbidity. Third, it is relatively inexpensive when the cost-saving of the short hospital stay is considered.

Conclusion

In upper-pole primary UPJO with an incomplete duplicated collecting system, if the guidewire can be inserted via the narrow segment of the upper-pole UPJ, RBD might be the first-choice surgical method instead of open or laparoscopic surgery.

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Conflicts of interest

There are no conflicts of interest.

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