Pyeloureterostomy in the Management of the Lower Pole Pelvi-ureteric Junction Obstruction in Incomplete Duplicated Systems

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OBJECTIVES To report our experience with the pyeloureterostomy (PU) for the treatment of the lower pole PUJO in incomplete duplex systems. The combination of the duplicated collecting system and pelviureteric junction obstruction (PUJO) is a rare association and infrequently reported. Surgical treatment can be challenging in such cases.

METHODS We retrospectively reviewed the medical data of the patients who had surgery from 2001 to 2009, with a diagnosis of PUJO of the lower pole moiety in incomplete duplex system. Demographic, diagnostic, and procedural data were recorded.

RESULTS Seven patients were identified with the lower pole PUJO associated with incomplete duplex systems. Their median age was 49 months (range 2-108 months). Prenatal hydronephrosis was detected in 3 patients, and 4 had a febrile urinary tract infection. PU was performed in 6 patients because od short ureteral length between the ureteropelvic junction and junction of lower and upper pole ureters. One patient was treated with the dismembered pyeloplasty because of sufficient ureteral length of the lower pole. No complications were detected during 14 months of follow-up.

CONCLUSIONS The management of the lower pole PUJO in incomplete duplex systems should be individualized for every patient. PU is a good surgical option in the management of the lower pole PUJO associated with incomplete ureteral duplication. UROLOGY 76: 1468–1471, 2010. © 2010 Elsevier Inc.

Duplication of the collecting system is the most common anomaly of the upper urinary tract, and it can be either incomplete or complete. The incidence of the duplicated collecting system has been reported as 0.8% in the literature. Other urinary tract anomalies, including vesicoureteric reflux (VUR), ureterocele, and ectopic ureter are frequently associated with the duplex system.[1]

Pelviureteric junction obstruction (PUJO) is the most common site of the obstruction in the urinary tract. Although duplicated collecting system and PUJO are common anomalies in pediatric urological practice, they are rarely together. PUJO in a duplicated collecting system usually affects the lower renal moiety in the incomplete ureteral duplication.[2,3]

The diagnosis and management of PUJO, associated with the duplicated collecting system can be difficult and complicated because of the high anatomic variability, the degree of obstruction and clinical aspects. Surgical management of the lower pale PUJO includes various techniques of the surgical reconstruction, such as pyeloplasty, pyeloureterostomy (PU), or ureteroureterostomy.

In the present study, we report our experience on the management of lower pole PUJO with incomplete ureteral duplication.

MATERIAL AND METHODS

We retrospectively reviewed the medical records of the patients who had undergone surgery from 2001 to 2009, diagnosed with PUJO of the lower pole moiety in incomplete duplex system. Demographical, diagnostic and procedural data were recorded. Urinary ultrasonography, voiding cystourethrography (VCUG) and diethylene triamine pentaacetic acide (DTPA) scintigraphy were used for the initial evaluation of the urinary system in all patients. Intravenous urography in 5 patients and retrograde ureteropyelography in 3 patients were required to demonstrate the precise anatomy before the open surgical procedure. Surgical indications of the patients were poor function of involved moiety, worsening of the hydronephrosis during the follow-up period, and urinary tract infection, respectively. PU was preferred as a surgical technique in 6 patients who had a narrow segment in the PUJO of the lower moiety, and pyeloplasty was performed in 1 patient who had a lower pole crossing aberrant vessel that was leading to PUJO. All surgical procedures were performed with open technique via flank incision. The identified narrow segment in the PUJO of the lower moiety was excised, and the upper pole ureter was sufficiently spatulated

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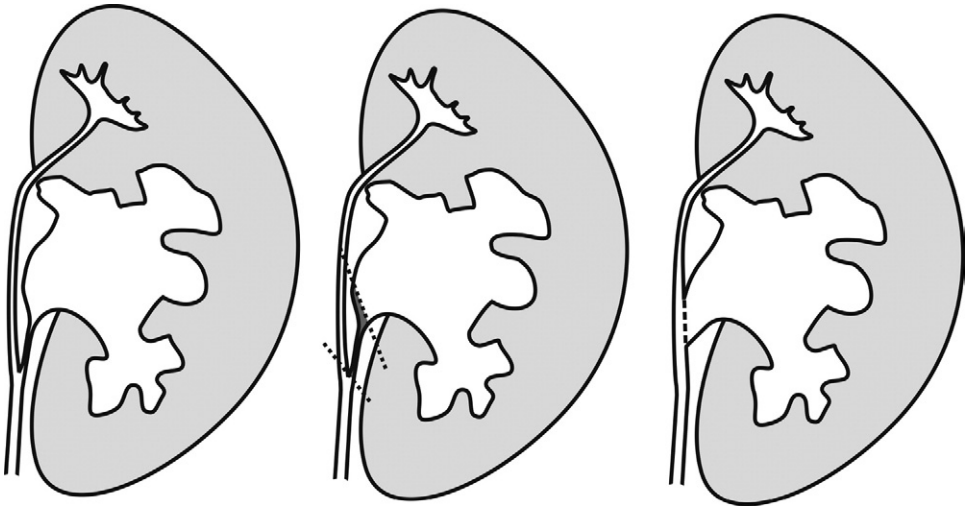

Figure 1. Descriptive diagram of the PU. The narrow segment in the PUJO of the lower moiety (gray zone) was excised, and then end-to-side PU was performed with the absorbable suture material.

Table 1. Data for the 7 patients with lower pole PUJO in the incomplete ureteric duplication

Patient	Age, Sex	Presentation	Side	Other G/U Anomaly	Operative Findings	Surgical Procedure	DTPA (%) Preoperative-Postoperative
1	4 y, F	UTI	*R*	VUR	Narrowed PUJ	PU	37-40
2	9 y, F	UTI	L	None	Aberrant vessel	pyeloplasty	35-37
3	2 mo, M	AH	R	Contralateral duplication	Narrowed PUJ	PU	42-45
4	5 mo, M	AH	L	None	Narrowed PUJ	PU	43-44
5	6 y, F	UTI	L	None	Narrowed PUJ	PU	32-36
6	2 mo, M	AH	L	A/R anomaly, VUR	Narrowed PUJ	PU	45-45
7	9 y, F	UTI	L	contralateral duplication	Narrowed PUJ	PU	30-33

AH, antenal hydronephosis; A/R, anorectal; G/U, genitourinary; mo, months; PU, pyeloureterostomy; PUJ, pelviureteric junction; UTI, urinary tract infection; y, years.

upward from the point of the junction of the lower and the upper pole ureter. Then an end-to-side PU over a double J stent was performed to connect the lower pole pelvis to the spatulated upper pole ureter (Fig. 1). An internal JJ ureteral stent was used in all patients for 6-8 weeks.

All patients were evaluated by ultrasonography and DTPA renal scintigraphy at 6 months after removal of the JJ stent.

RESULTS

Lower pole PUJO, associated with an incomplete collecting system, was noted in 7 patients (4 girl and 3 boys). Their median age at surgery was 49 months (range 2-108 months). Prenatal hydronephrosis was detected in 3 patients, and 4 had a febrile urinary tract infection. Whereas PUJO was demonstrated in 5 patients on the left side, only 2 had a right side involvement (Table 1). Hydronephrosis was shown in all patients by ultrasonography. In terms of genitourinary anomaly, VUR was demonstrated by VCUG in 2 patients. By contrast, 2 patients had a contralateral incomplete duplication. PUJO of the lower pole and the short lower pole ureter was clearly demonstrated by intravenous pyelography (Fig. 2). DTPA renal scintigraphy showed the presence of the obstructive pattern or the delayed clearance in the involved moiety in all patients (Fig. 3a, 3b).

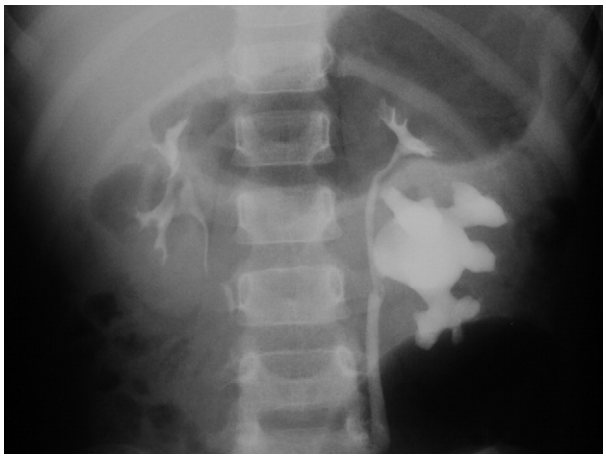

Figure 2. Short and narrow ureter of the lower pole is clearly appeared in the intravenous pyelogram.

PU was performed in 6 patients having a narrow segment in the PUJ of the lower moiety, because of insufficiency of the ureteral length between the PUJ and the

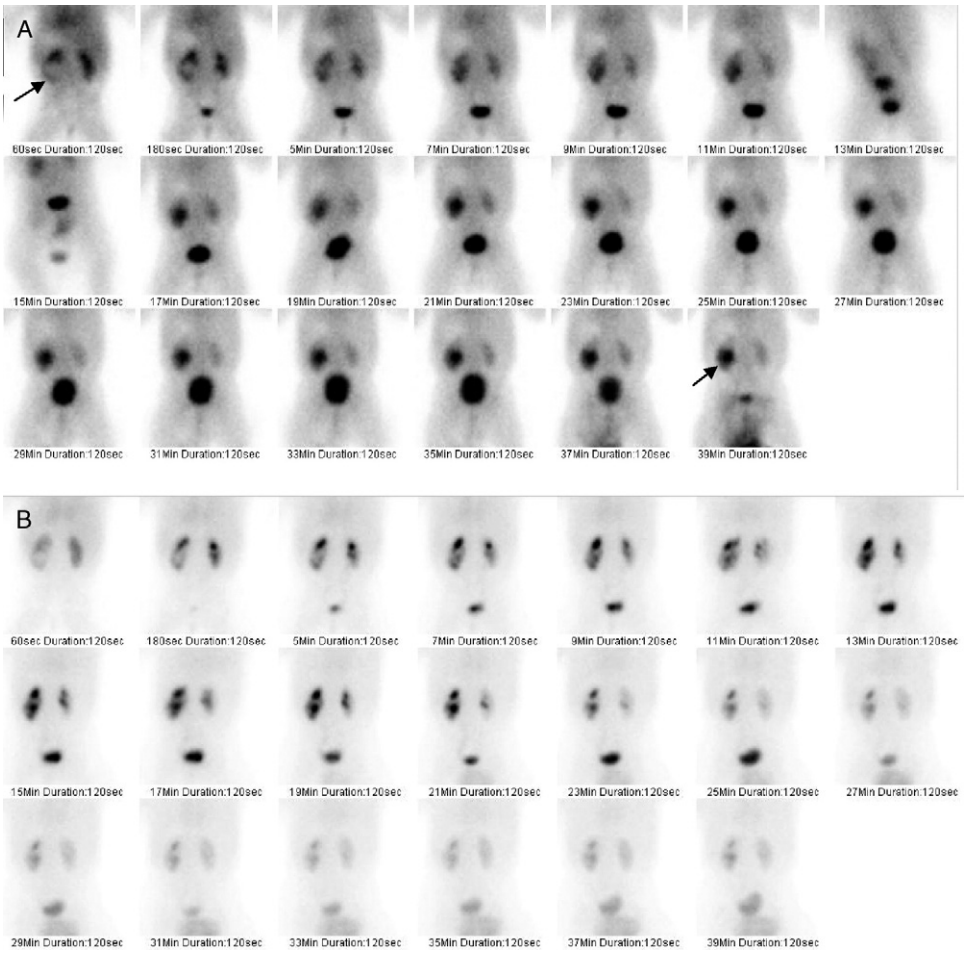

Figure 3. (**A**) Preoperative DTPA scan showing the delayed clereance in the lower pole of the left kidney at early time. Obstructive pattern was identified in the same moiety at late period (arrows). (**B**) Postopretive DTPA renogram shows nonobstructive pattern in the same patient.

junction of the lower and the upper pole of the ureter, which was identified during the surgical process. In 1 patient, the obstruction of the lower pole of the UPJ, which was secondary to the lower pole crossing aberrant vessel, was fixed during the operation. This patient was then treated with dismembered pyeloplasty because of the sufficient ureteral length of the lower pole.

Postoperative ultrasonography showed significant improvement in hydronephrosis in all patients. Recurrence of the obstruction at the anostomosis level was not detected, and the postoperative renal scintigraphy findings demonstrated that the renal function of the lower moiety was improved in 6 patients with a mean follow up period of 14 months (range 4-48 months) (Table 1).

COMMENT

PUJO and duplicated collecting system are common congenital anomalies of the urinary tract, but seldom occur in combination. Since there are limited numbers of papers relevant to the PUJO in the duplicated collecting systems, the exact incidence is unknown. Larger series report an incidence of 2%-7% of PUJO in duplex systems.[2,4,5] The PUJO of the lower pole both with the complete and incomplete duplex systems is a common cause of the obstruction. This may be explained by the fact that the lower segment is anatomically the analogue of a single renal system, which usually corresponds about the two-third of the parenchyma, and at least 2 calyces and a true renal pelvis. However, true PUJO of the upper moiety is a very rare occurrence, involving both complete and incomplete duplicated systems. In a recent study, whereas eight (73%) of the 11 cases were associated with the PUJO at the lower pole ureters, the PUJO at the upper pole ureters was reported only in 3 patients (27%).[2] In our series, the PUJO was identified only at the lower pole in all patients, together with incomplete duplicated systems. There was no patient having PUJO at the upper pole in association with complete or incomplete duplex systems.

The clinical presentation of the PUJO is similar to other obstructive uropathies. Antenatal ultrasonography is an important novel technique used for the diagnosis of hydroneprosis. It allows an early decision and constitutes a background for postnatal evaluation. Hydronephrosis

associated with duplicated collecting systems may be easily detected using antenatal ultrasonography. In 3 patients in our series, the diagnoses were made using antenatal ultrasonograpy screening.

The function of the affected renal moiety and the detailed radiological evaluation of an obstructed duplicated system are important for the decision of the best surgical approach. Renal ultrasound is a simple method to demonstrate the hydronephrosis in obstructed duplicated systems. If there is a hydronephrosis in the lower pole, VCUG is necessary to exclude the lower pole reflux. Intravenous urography may provide the information of the anatomy of the collecting system.[7] This imaging technique has been performed in 5 patients among our series, and it helped to demonstrate the anatomical relationship between both ureters (Fig. 2). A diuretic renogram may show the renal function level and the degree of the obstruction.[6] Because all patients in our series had a lower moiety with reasonable renal function, we preferred to salvage it with reconstructive surgery. Retrograde ureteropyelography is a helpful way to determine the relationship between in both ureters with incomplete duplicated systems in which the anatomy of the region remains unclear.

The review of previous reports and the variety of the published surgical techniques in the literature suggest that the surgical technique for the treatment of the PUJO should be individualized for every patient.[2,3,6-8] Surgical management of these patients depends on anatomical features and the degree of the renal function in the affected segment of the each patient. If there is a massive hydronephrosis with no function in the parenchyma, a heminephrectomy of the affected pole may be selected.[7-9] Standard dismembered pyeloplasty is the most appropriate option in the complete or nearly complete duplex systems.[2,7,9] In the lower pole PUJO, associated with incomplete duplicated system, the length of the lower pole ureter is the major determinant factor for the selection of the surgical technique. If the lower pole ureter is short, the PU may be considered.[6] PU is one of the available surgical techniques to manage the duplex systems with the lower pole PUJO. Shelfo et al. reported that the end-to-side PU was a successful technique with a low complication rate for managing lower pole reflux with associated ureteropelvic junction obstruction in duplex systems.[10] It has been shown that from lower pole to upper pole, PU was a safe and effective reconstructive surgical technique for the lower pole PUJO associated with incomplete duplex systems.[3,6] Furthermore, laparoscopic PU has been recently reported as an effective and minimal invasive option to open approach in children.[11] We have performed end-to-side PU in 6 patients in our series. All patients who underwent operation with PU had good postoperative outcomes. No immediate or long-term complications were noted, and no further surgical procedures were needed.

In conclusion, duplicated collecting systems and PUJO are common anomalies of the urinary system but rarely occur together. Management should be individualized for every patient. This requires a careful preoperative evaluation to understand the anatomy of the anomaly for the surgical treatment regimen, which also varies according to the anatomical features of the pathology. We believe that the PU is a safe and effective surgical technique in the management of the lower pole PUJO associated with incomplete ureteral duplication.

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