International Journal of Surgery 34 (2016) 23–27

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Original Research

The morphology and treatment of coexisting ureteropelvic junction obstruction in lower moiety of duplex kidney

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HIGHLIGHTS

- UPJO of the lower pole in a duplex renal system is infrequently seen and reported.
- The length of ureter between the UPJ and confluence of ureters is the major determinant of reconstructive surgery.
- Retrograde ureteropyelography is a helpful way to determine the relationship in both ureters.
- Laparoscopic end-to-side PU and pyeloplasty are an effective and minimal invasive option.

ARTICLE INFO

Article history:
Received 4 June 2016
Received in revised form
3 August 2016
Accepted 15 August 2016
Available online 18 August 2016

Keywords:
Duplex kidney
Ureteropelvic junction obstruction
Lower moiety
Pyeloureterostomy
Laparoscopy
Child

ABSTRACT

Background: Duplex kidney is a common congenital anomaly of the urinary tract, while ureteropelvic junction obstruction (UPJO) in lower unit of duplex kidney is rare. Surgical treatment can be challenging in such cases. The aim was to report our experience in managements of UPJO in lower moiety of duplex kidney.

Methods: Among the pediatric patients with duplex system from 2007 to 2013, 7 children were diagnosed with UPJO in lower moiety. Their medical records were retrospectively analyzed, mainly focused on anatomic aspects and operation details.

Results: The lower pole UPJO associated with incomplete duplex systems were identified in 6 patients on the left side and 1 on the right side. Median patient age at surgery was 11 months (range 6–84 months). Prenatal hydronephrosis was detected in 4 patients, and 3 had intermittent abdominal pain. Hydronephrosis, thin parenchyma and presence of UPJO in lower moiety could be shown on computed tomography urogram (CTU). The ureters were fused in a "Y" shape without any dilation. Based on the length between UPJO to the confluence in retrograde ureteropyelography, patients were classified into group 1 (5 cases,≤3 cm) and group 2 (2 cases, >3 cm). In group 1, surgical procedure involved end-to-side pyeloureterostomy of the lower pelvis to the ureteral confluence in 4 cases and laparoscopic pyeloureterostomy in one case. The two patients in group 2 underwent laparoscopic pyeloplasty of lower moiety. In all of these patients hydronephrosis gradually improved and no complications were detected during follow-up.

Conclusions: UPJO in a duplex kidney requires careful evaluation and treatment should be individualized. Ureteropyeloanastomosis is a feasible treatment for duplex kidneys associated to a functioning lower moiety with UPJO. With the technical improvements in laparoscopic pyeloplasty, this procedure can be performed using laparoscopy.

1. Introduction

The incidence of the duplicated collecting system has been reported as 0.8% in the literature [1]. They can be uncomplicated, in which case no treatment is necessary, or be complicated by other associated urological anomalies. Ureteral ectopia and ureterocele are the conditions most commonly associated with the upper pole of a duplex system, whereas vesico-ureteral reflux and ureteropelvic junction obstruction(UPJO), those most commonly

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http://dx.doi.org/10.1016/j.ijsu.2016.08.015
1743-9191/

associated with the lower pole [2]. Many treatment alternatives are available, depending on the functional and anatomical status of the affected units. If renal function in one moiety is very poor, as frequently observed in the upper unit, polar nephrectomy is the most appropriate procedure. However, when the anatomical and functional impairment of this moiety is less dramatically impaired, it may be preserved, therefore requiring a reconstruction to allow better drainage [3].

To date, the UPJO in lower unit is infrenquently reported. The diagnosis and management of UPJO, associated with the duplex systems can be difficult and complicated because of the high anatomic variability, the degree of obstruction and clinical aspects. In the present study, we report our experience with the treatment of UPJO in lower unit of duplex kidneys in children and preservation of the affected renal unit.

2. Patients and methods

Following approval by the institutional review board, we retrospectively reviewed the medical records of the patients who treated at our institution between January 2007 and June 2013 for a duplex system associated with UPJO in lower unit. All patients underwent urinary ultrasonography, voiding cystourethrography, CTU and diethylene triamine pentaacetic acide (DTPA) scintigraphy before surgery. Retrograde ureteropyelography was performed to demonstrate the precise anatomy. Our criteria for surgery included symptomatic obstruction, asymptomatic obstruction with >10% decrease in renal function of the affected renal moiety and an increase in hydronephrosis with antero-posterior pelvic diameter greater than 3 cm during the follow-up period. Surgical management of the lower pole UPJO includes various techniques of the surgical reconstruction, such as pyeloplasty and pyeloureterostomy (PU). Patients were followed with ultrasonography and DTPA at 3–6 months postoperatively and repeated subsequently if needed. Demographic data, diagnosis, surgical procedure and complications were analyzed.

3. Results

3.1. Initial diagnosis

We identified seven patients with lower pole UPJO in incomplete ureteral duplication among 109 children underwent surgery for duplex kidney. The UPJO in upper unit and in complete ureteral duplication were not seen in our series. Of the 7 patients (5 boys and 2 girls), 3 had intermittent abdominal pain and 4 had prenatal detection of hydronephrosis. Their median age at surgery was 11 months (range 6–84 months). UPJO was demonstrated in 6 patients on the left side, and only 1 had a right side involvement. Preoperative ultrasonography revealed severe hydronephrosis and thin parenchyma and duplex kidney with UPJO of lower moiety was diagnosed by CTU (Fig. 1). The size of the upper moiety was smaller than the lower moiety with normal function and no hydronephrosis. These patients displayed no evidence of vesicoureteral reflux during voiding cystourethrography. DTPA renal scintigraphy showed the presence of the obstructive pattern or the delayed clearance in the involved moiety in all patients. Mean preoperative differential renal function and t½ were 33% and 78 min, respectively. The ureters of the upper and lower moiety were fused in a "Y" shape to form a single ureteral orifice without any dilation. Narrowing of the lower ureter at the UPJ and severe dilation of the adjacent lower pole renal pelvis were clearly demonstrated by retrograde ureteropyelography (Fig. 1).

3.2. Surgical management and outcomes

According to the length between UPJO and the confluence, patients were classified to group 1(5 cases,≤3 cm) and group 2 (2 cases, >3 cm). Surgical findings revealed a distinct site of ureteral narrowing and obstruction in each patient. No patients were obstructed secondary to crossing renal vessels. In group 1, surgical procedure involved end-to-side pyeloureterostomy (PU) of the lower pelvis to the ureteral confluence in 4 cases and laparoscopic PU in one case (Fig. 2) because of insufficiency of the ureteral length between UPJO and the junction of lower and upper ureters. The narrow segment in the UPJO of the lower moiety was excised and a longitudinal incision was made in the inferior moiety pelvis. The upper pole ureter was sufficiently spatulated upward from the confluence and then an end-to-side PU was performed to connect the lower pole pelvis to the upper pole ureter confluence. The two patients in group 2 underwent laparoscopic standard dismembered pyeloplasty of lower moiety (Fig. 3). Postoperatively, double J stents were left indwelling in the lower moiety and were removed 6–8 weeks after surgery.

No intraoperative complications were recorded. Post-operative retrograde ureteropyelography when removing double J stents showed patent upper and lower pole ureters with good drainage (Fig. 4). In all the cases, the hydronephrosis improved and the mean (range) antero-posterior diameter of the renal pelvis was 13 (10–22) mm on the 6-month follow-up US, compared with preoperative 30 (22–39) mm. Also no case showed new onset upper pole dilatation on the US nor recurrence of lower pole dilation. The 6-month follow-up renography showed all repaired renal segments demonstrated improvements in function and empting with mean renal function and t½ of the lower pole was 45% and 15min. All patients remained asymptomatic during a median (range) follow-up of 29 (6–72) months.

4. Discussion

Larger series report an incidence of 2%–7% of UPJO in duplex systems [4–6]. The UPJO of the lower pole both with the complete and incomplete duplex systems is a common cause of the obstruction. However, true UPJO of the upper moiety is a very rare occurrence. 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 [7]. In our series, the UPJO was identified only at the lower pole in all patients, together with incomplete duplicated systems. There was a male preponderance, with a 5 to 2 male to female ratio, all of whom had no other detectable urologic or other congenital anomalies.

The clinical presentation of these patients is similar to that in single-system UPJO. Four of 7 patients were diagnosed antenatally with unilateral hydronephrosis. Careful radiological evaluation of an obstructed duplicated system is important, especially to decide 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. CTU or IVP may provide the information of the anatomy of the collecting system [8]. DTPA renal scintigraph will show loss or preservation of renal function as well as impaired drainage [7]. Retrograde ureteropyelography is a helpful way to determine the relationship between in both ureters with incomplete duplicated systems [9]. These imaging techniques have been performed in all patients of our series, and it helped to demonstrate the anatomy and function of the affected renal moiety.