Surgical Outcomes of Upper Tract Approach and Lower Tract Approach in Duplex Kidney: Single Center Experience

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ABSTRACT

Objective: We reviewed the result of upper and lower tract approaches in duplex collecting systems at Siriraj Hospital between January 2011 and January 2017, focusing on reoperation rate and postoperative urinary tract infection.
Methods: We analyzed the medical records of 57 patients with duplex kidneys, ectopic ureter and ureterocele. 45 patients were treated with open surgical therapy including upper tract approach which consisted of upper pole nephrectomy and ureteropyelostomy, and lower tract approach which was common sheath reimplantation. Information included age at operation, gender, ectopic ureter and ureterocele location, vesicoureteral reflux (VUR), hydrohephrosis status and presenting symptoms.
Results: Upper tract approach was performed in 23 patients, 3 patients were reoperated because of persistent ureterocele in 2 cases and VUR in 1 case (13.6%, p = 0.233). One was lost to follow-up. Among 22 patients who underwent lower tract approach, no patient required second operation with antibiotic prophylaxis.
Conclusion: In the absence of ureterocele and VUR, upper tract approach surgery appears to be successful treatment of duplex kidneys. When compared with upper tract approach, the lower tract approach surgery is more effective for open surgical therapy in duplex kidneys if sample size increases.

Keywords: Duplex kidney; double collecting system; upper tract approach; lower tract approach; ureterocele; ectopic ureter (Siriraj Med J 2018;70: 17-21)

INTRODUCTION

Patients with duplex collecting system may have wide range of presentation i.e. ectopic ureter, ectopic ureterocele, obstruction or reflux as well as moiety function. Due to these the treatment modalities and approaches are still controversial.

Treatment may be endoscopic or open and the approach can be upper tract approach consisting of upper pole nephrectomy or ureteropyelostomy depending upon the moiety function. Lower tract approach consists of common sheath reimplantation and ureterocele excision.[1,5]

Many reports on endoscopic management showed about 70-80% of ureteroceles can be successfully treated which supported the endoscopic treatment on the grounds of less aggressive choice.[5,7,10]

Since the advantage of endoscopic treatment for intravesical ureterocele patient was already well defined[10], we tried to refine our results to find the concept for best practice in duplex patients comparing upper tract and lower tract approach.

MATERIALS AND METHODS

After approval of the Institutional Ethics Committee (Si 450/2017), we reviewed the medical records of 57 patients with duplex kidneys, ectopic ureter and ureterocele

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who underwent operation at Siriraj Hospital between January 2011 and January 2017.

Information included gender, ectopic ureter and ureterocele location, age at operation, vesicoureteral reflux (VUR), hydronephrosis status, initial serum creatinine and presenting symptoms. Preoperative diagnostic studies included ultrasonography, voiding cystourethrography (VCUG), intravenous pyelography (IVP) or computed tomography urography (CTU) or magnetic resonance urography (MRU), 99m-Tc-dimercaptosuccinic acid (DMSA) or renal scintigraphy and examination under anesthesia (EUA). Primary outcome was the requirement for secondary procedure as a definitive treatment. At the follow up visit we assessed urinary tract infection (UTI), incontinence, ultrasonography, VCUG and renal scintigraphy.

RESULTS

We analysed 57 patients with ectopic ureters or ectopic ureteroceles in our study. Twelve patients were excluded from the study which consisted of 9 patients with endoscopic treatment, 1 patient with chronic kidney disease (CKD) at initial presentation, 1 patient with supernumerary kidneys and one patient with single system ureterocele. Forty-five patients were treated with open surgical therapy including upper tract approach which consisted of upper pole nephrectomy and ureteropyelostomy and lower tract approach which was common sheath reimplantation and excision of ureterocele. There were 23 upper tract and 22 lower tract procedure. The median follow up was 33 months (range 7-60 months).

From the demographic data, there were no statistically difference in age, gender, initial serum creatinine, complete or incomplete duplication and side comparing between both groups. The patients mostly presented with UTI with no statistically difference between both groups. (Tables 1-3)

The patient in upper tract approach group presented with ectopic ureter 6 cases, ectopic ureterocele 14 cases and incomplete duplex 3 cases. Upper pole nephrectomy was performed in 18 renal units and ureteropyelostomy was performed in 5 renal units. From the lower tract approach group, the patient presented with ectopic ureter 18 cases, ectopic ureterocele 3 cases, incomplete duplex 1 case. Open common sheath reimplantation was used in 16 renal units, ureterocele excision with common sheath reimplantation was used in 3 renal units and laparoscopic pneumovesicum was used in 3 renal units.

According to the primary outcome in our study, secondary procedures were needed in 3 cases out of 22 in upper tract approach whereas, there was no secondary procedure in lower tract approach. Among the 3 patients that required secondary operation in upper tract approach, 2 had persistent ureterocele and one

TABLE 1. Demographic data of the patients with duplex kidney.

	Lower Tract Approach (n = 22)	Upper Tract Approach (n = 23)	P-value
Age (years)	4.45 (1.5-22)	2.67 (0.58-36)	0.134
Sex			0.372
Female	17 (77.3%)	15 (65.2%)	
Male	5 (22.7%)	8 (34.8%)	
Side of duplex kidney			0.842
Left	13 (59.1%)	13 (56.5%)	
Right	6 (27.3%)	5 (21.7%)	
Bilateral	3 (13.6%)	5 (21.7%)	
Serum creatinine	0.4 (0.2-0.9)	0.4 (0.1-0.8)	0.916
Ipsilateral duplex system			0.608
Complete duplex	21 (95.5%)	20 (87.0%)	
Incomplete duplex	1 (4.5%)	3 (13.0%)	

TABLE 2. Presenting symptoms of the patients with duplex kidney.

	Lower Tract Approach (n = 22)	Upper Tract Approach (n = 23)	P-value
Symptoms			
UTI	20 (90.9%)	19 (82.6%)	0.665
Incontinence	9 (40.9%)	2 (8.7%)	0.012
Flank pain	2 (9.1%)	0 (0%)	0.233
Prenatal US	2 (9.1%)	3 (13.0%)	1
Incidental finding	0 (0%)	3 (13%)	0.233
LUTS	1 (4.5%)	4 (17.4%)	0.346
Asymptomatic pyuria	1 (4.5%)	4 (17.4%)	0.346

Abbreviations: urinary tract infection = UTI, ultrasound = US, lower urinary tract symptoms = LUTs

TABLE 3. Indication for surgery in the patients with duplex kidney.

	Lower Tract Approach (n = 22)	Upper Tract Approach (n = 23)	P-value
Indication for surgery			
Breakthrough UTI	13 (59.1%)	11 (47.8%)	0.449
Severe UTI	5 (22.7%)	5 (21.7%)	1
Poor renal function	3 (13.6%)	10 (43.5%)	0.027
Increased cortical scar	1 (4.5%)	2 (8.7%)	1
Symptomatic	9 (40.9%)	4 (17.4%)	0.082

Abbreviation: urinary tract infection = UTI

had VUR. All underwent lower tract procedures. The rate of secondary procedure was higher in upper tract approach, but there was no statistically significant (P = 0.233) difference in our study. There was no statistical difference of perioperative complication in both groups. Four patients each in upper tract and lower approach had postoperative fever which was managed conservatively. There was no wound infection, incontinence or other perioperative complications in our study. (Table 4)

In the follow up period after upper pole nephrectomy, ureterocele was decompressed well (11/14 cases, 78.6%). Ureteropyelostomy also had satisfactory outcome. All 5 cases had improvement of hydronephrosis from ultrasonographic or renogram findings. In the follow up of lower tract approach including pnemovesicoscopic common sheath reimplantation, we found improvement of hydronephrosis in all cases except 2 patients who had persistent hydronephrosis and no progression during the follow up period. All of them could eventually discontinue prophylactic antibiotic.

DISCUSSION

The goals in management of ureteroceles and ectopic ureters are renal function preservation, UTI prevention, and incontinence correction. The treatment options are sometimes controversial and depend on surgeon's preference. There are many factors that we have to concern including renal function of each moiety, opening of ectopic ureters and type of ureteroceles, and presentation of VUR.

TABLE 4. Post operative complications in the patients with duplex kidney.

	Lower Tract Appriach (n = 22)	Upper Tract Approach (n = 23)	P-value
Re-operation	0 (0%)	3 (13.6%)	0.233
Perioperative complications			1
No complication	18 (81.8%)	19 (82.6%)	37
Fever with UTI	4 (18.2%)	4 (17.4%)	8
Hospital stay	11 (5-25)	7 (5-25)	0.001
Urinary incontinence	0	0	0
Follow up time	31.17 (8.18 - 60.39)	33.24 (7.03-70.24)	(p=0.963)

Abbreviation: urinary tract infection = UTI

There are many choices of treatment which can be categorized into endoscopic and surgical approach techniques which can be performed in two approaches. First, upper tract approach which is upper pole nephrectomy and ureteropyelostomy. The second, lower tract approach which are reimplantation and excision of ureterocele.

Nowadays endoscopic ureterocele incision already has its own specific usage especially in intervesical ureterocele[3,6], but surgical approach for upper tract and lower tract corrections still have to be defined in their own suitable cases. According to our study lower tract approach delivers excellent outcome with no secondary procedure, low perioperative complication rate, no incontinence, no UTI during the follow up period which is the same as previous studies.[12,13] Also this procedure also corrects high grade reflux with high success rate.[11] However, it still has disadvantage of longer hospital stay and extensive reconstructive procedure.[9]

We performed 3 cases of pnemovesicoscopic common sheath reimplantation in complete renal duplication where both ureteral openings were intravesical and close to each other. The technique is feasible to perform, but takes a longer operative time. There was no complication in all 3 cases and antibiotic prophylaxis could be discontinued. There has been no literature which has reported this operation in duplex cases.

Upper tract approach including upper pole nephrectomy and ureteropyelostomy are less extensive procedures and have high rate of ureterocele decompression in our study (78.6%). The result was related to retrospective study of Husman D, et al in which 17 of 72 patients with ectopic ureterocele were treated with endoscopic decompression after partial nephrectomy (24%).[4] As in J Gomes et al's report, decompression of ureterocele was detected in all cases.[6] The disadvantage of this approach is incidence of secondary procedure that is caused by secondary VUR or residual ureteral stump infection.[2,8] In our study there were 3 cases (3/23 cases, 13.04%) that needed secondary procedure in upper tract approach which was comparable to previous studies 12%[1] and 18%.[14] The important technique to reduce this complication is upper ureteral removal as distal as possible.

In comparison to lower tract approach, upper tract approach is easier to perform and provides good outcome especially in the circumstance that reflux is absent, but pediatric urologist should be familiar with both approaches. The main reason is lower tract approach provide the excellent result for duplex kidneys with VUR regardless of reflux grading and it is also the definitive operation after failure of upper tract approach.

CONCLUSION

In the absence of ureterocele and VUR, upper tract approach surgery appears to be successful treatment of duplex kidneys. When compared with upper tract approach, the lower tract approach surgery is more effective for open surgical therapy in duplex kidneys if sample size increases.

However, there were limitations in our study. The retrospective nature of this study had some potential bias such as operation selection and small sample size. The time of follow up was also not enough to evaluate subsequent complications such as hypertension.

Conflict of interest

All authors have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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