

Original Article

Long term complications associated with the ureteric stump in patients with double collecting system who underwent upper pole heminephrectomy

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Abstract

Objective: To assess the long-term ureteric-stump outcomes and complications among patients who had undergone upper-pole heminephrectomies of double collecting systems.

Materials and Methods: The medical records of patients who had undergone upper-pole heminephrectomies for non-functioning upper moiety between January 2007 and December 2018 were retrospectively reviewed. Data regarding clinical presentations, age during surgery, operative details, and complications were recorded.

Results: Ten patients were included in the study, nine were children and one was an adult. Double collecting systems with ureterocele were found in four patients, ectopic ureters being found in six. Nine patients had undergone open heminephrectomies, whereas one patient had undergone robot-assisted surgery. Median age at heminephrectomy was one year old (range: 0.58 to 74 years). Median follow-up time was 81.1 months (range: 40.6 to 140.1 months). Median length of hospital stay was seven days (range: 5 to 22 days). Three patients (30%) had stump complications, including stump abscess in one patient, persistent vaginal discharge in another, and a prolapsed ureterocele in the third. Additional interventions were required in two patients, comprising percutaneous drainage of a stump abscess and the excision of a prolapsed ureterocele.

Conclusions: Our study found three-cases of long-term complications, with only a single patient requiring distal ureteric stump excision. These findings were similar to another study which also showed that the majority of patients did not require stump excision. Other complications were minor and could be treated by local anesthetic intervention for stump abscess and oral antibiotic for UTI. Therefore, upper pole heminephrectomy with subtotal ureterectomy was the appropriate option for in-patients with double collecting system and non-functioning upper moiety.

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Introduction

Duplication of the collecting system of the upper urinary tract, or duplex kidney, is a congenital anomaly among children, with a childhood incidence of 0.8%.^{1,2} Duplication of the ureter and renal pelvis can be either complete or incomplete. A ureterocele or an ectopic ureter commonly originates from upper moiety, whereas vesicoureteral reflux frequently occurs in the lower moiety ureter.³ In the case of ectopic ureters with a functioning upper moiety, common treatments are common sheath reimplantation or ureteroureterostomy. For ureteroceles with a functioning upper moiety, treatment options are transurethral-incision ureterocele or common sheath reimplantation with excision ureterocele or ureteroureterostomy. For a nonfunctioning upper moiety, due to obstructive nephropathy, the standard treatment is upper-pole heminephrectomy.⁴ Subtotal ureterectomy is considered to remove the ureter as distally as possible at the same exposure and incision of a heminephrectomy.⁵ However, the remaining distal ureteric stump after such procedures may cause a febrile urinary tract infection (UTI), lower-quadrant pain, and/or hematuria.⁶ Recently, laparoscopic ureteral clipping has been used to treat non-functioning or poorly functioning renal moieties with ectopic ureters or obstructive ureteroceles; no long-term data are available on this treatment.⁷ This study aimed to review the long-term outcomes and complications of ureteric stumps in patients who had undergone heminephrectomies for double collecting systems with non-functioning upper moieties.

Materials and Methods

After receiving ethical approval from the Committee on Human Rights Related to Research involving Human Subjects at the Faculty of Medicine of Ramathibodi Hospital (MURA2018/472), we conducted a retrospective review of patients with double collecting systems who had undergone upper-pole heminephrectomies for non-functioning upper moieties at Ramathibodi Hospital between January 2007 and December 2018. Data including sex, presenting symptoms, preoperative imaging, diagnosis, affected side, surgical procedure, ureter-management details, age at the time of operation, pathology, follow-up time, and intraoperative, early postoperative, and late post-

operative complications were collected. Patient baseline characteristics and details of the procedures were reported as frequency with percentage of mean with standard deviation (SDs) or median with range.

Results

Ten patients with double collecting systems were included in this study. Among these 10 patients, nine were children (eight girls and one boy) and one patient was an adult. Clinical presentations included febrile UTIs for nine patients, prenatal hydronephrosis for one patient, vaginal discharge for two patients, and a protruding vaginal mass for one patient. The adult patient had presented with flank pain. The details of patient disease characteristics are shown in Table 1. We defined the non-functioning upper moiety by a finding from ultrasound that showed a paper-thin cortex or by renal scan that showed no radio nucleotide uptake in the upper moiety.

For radiological evaluation, genitourinary tract ultrasound scans were performed in all patients. Five patients underwent intravenous pyelogram (IVP), computed tomography (CT), or

Table 1. Baseline characteristics of patients

Ureteric stump (N = 10)	n (%)
Gender	
Male	1 (10)
Female	9 (90)
Age (years), median (range)	1 (0.58, 74)
Presenting symptoms	
Febrile UTI	5 (50)
Febrile UTI with vaginal discharge	2 (20)
Febrile UTI with protruding vaginal mass	1 (10)
Prenatal diagnosis with febrile UTI	1 (10)
Flank pain	1 (10)
Diagnosis	4 (40)
Double collecting system with ureterocele	
- Extravesical ureterocele 3 cases	
- Intravesical ureterocele 1 case	
Double collecting system with ectopic ureter	6 (60)
- Opening to vagina 2 cases	
- Opening to bladder 2 cases	
- Opening to urethra 1 case	
- Opening to bladder neck 1 case	
Side	
Left	8 (80)
Right	2 (20)

UTI = urinary tract infection

magnetic resonance imaging (MRI) in addition to ultrasonography as their anatomy and pathology could not be clearly identified using ultrasonography alone. Voiding cystourethrography (VCUG) was performed in seven patients in an attempt to evaluate vesicoureteral reflux (VUR). Renal scans using mercaptoacetyltriglycine (MAG3), diethylenetriamine pentaacetic acid (DTPA), or dimercaptosuccinic acid (DMSA) were performed in six patients.

All patients had double collecting systems with a non-functional upper moiety. Ureterocele were found in four patients, and one patient had a previous transurethral incision (TUI) ureterocele due to protrusion from their vagina. VUR grades 3-4 at the upper moiety were found in the patient who had a previous TUI ureterocele. Ectopic ureters were found in six patients. VUR grades 4-5 at the lower moiety were found in three patients and all VUR were decreased to grades 3 postoperatively.

Median age of the patients at the time of heminephrectomies was one year (range: 0.58 to 74 years). Median operation time was 120 minutes (range: 95 to 180 minutes). Left-side heminephrectomies had been performed in eight patients, and right-side heminephrectomies had been performed in two patients. A robot-assisted heminephrectomy had been performed in one adult patient. Three patients had clip or ligated distal ureteric stumps, six patients had left open distal ureteric stumps, and one patient had no record regarding a distal ureteric stump. Median length of related hospital stay was seven days (range: 5 to 22 days). Median follow-up time was 81.1 months (range: 40.6 to 140.1 months). The details of patients' perioperative and postoperative outcomes are shown in Table 2.

Intraoperative complications comprised collecting-system injuries of the lower moiety in two patients (repaired with chromic catgut) and renal-vessel injury of the lower moiety in one patient (repaired with Prolene®). Early postoperative complications were found in three patients, two of whom had experienced turbid urine intraoperatively. One of these three patients had experienced febrile UTI, while another patient had experienced febrile UTI with surgical-site infection that required stitch removal, dressing, and re-suturing of the surgical wound. The other patient had experienced febrile UTI. Late post-

operative complications were found among five patients, three of whom had stump complications. A summary of the details of surgical complication are shown in Table 3.

Discussion

Duplex kidney or double collecting systems are usually associated with an ectopic ureter or a ureterocele. Upper-pole heminephrectomy is an appropriate treatment for a non-functioning upper moiety of a duplex kidney.^{2,4} The appropriate management of a distal ureter, such as a total or subtotal ureterectomy, remains under debate in the literature. In the case of a subtotal ureterectomy the ureter is divided as low as possible through an upper-pole heminephrectomy incision. The remaining distal ureteric stump may cause problems, such as febrile UTI, lower-quadrant pain, or hematuria.⁸ These complications may be as a consequence of urine stasis in the distal ureteric stump, which acts as a reservoir.^{9,10} This study aimed to evaluate long-term complications of the distal ureteric stump after an upper-pole heminephrectomy as few data have been available with regard to this area.

Plaire et al.¹⁰ reported that four out of 32 patients required a secondary operation for distal ureteric stump excision. Three patients had febrile UTIs, and another patient had flank pain with voiding.¹⁰

Table 2. Perioperative and postoperative outcomes

Ureteric stump (N = 10)	n (%)
Surgical operation	
Open	9 (90)
Robot	1 (10)
Distal ureter	
Clip or ligated stump	3 (30)
Opened stumps	6 (60)
Not recorded	1 (10)
Operative time (minutes), median (range)	120 (95, 180)
Length of stay (days), median (range)	7 (5, 22)
Follow-up time (months), median (range)	81.1 (40.6, 140.1)
Pathology	
Chronic inflammation or infection	6 (60)
Oligonephric hypoplasia	1 (10)
Not recorded	3 (30)

UTI = urinary tract infection



Table 3. Surgical complications

No.	Presenting symptoms	Sex	Background disorder	Surgery before heminephrectomy	Age during heminephrectomy	Intraoperative and early complications	Late complications	Treatment	Time to additional intervention
1	Febrile UTI	F	Lt double collecting system with ureterocele	-	7 months	UTI	Single episode of UTI	Oral ATB	-
2	Febrile UTI with vaginal discharge	F	Lt double collecting system with ectopic ureter	-	2 years	Renal-vessel injury of the lower moiety (repaired with Prolene®); UTI	Persistent vaginal discharge; declining lower-moiety function	Supportive treatment	-
3	Febrile UTI with protruding vaginal mass	F	Rt double collecting system with prolapsed ureterocele	Endoscopic puncture of the Rt ureterocele	2 years	-	Prolapsed ureterocele	Excision ureterocele and distal ureteric stump	11 months
4	Febrile UTI with vaginal discharge	F	Lt double collecting system with ectopic ureter	-	1 year	UTI; surgical-site infection	Ureteric stump abscess	Percutaneous abscess drainage	2 months
5	Febrile UTI with prenatal HN	F	Lt double collecting system with ectopic ureter	-	1 year	-	UTI	On Bactrim® prophylaxis until 5 years old	-

UTI = urinary tract infection, F = female, Lt = left, Rt = right, ATB = antibiotic, HN = hydronephrosis

Meanwhile, De Caluwe et al.⁴ evaluated long-term ureteric-stump complications. Five of their patients (10%) had recurrent UTIs and were treated with distal ureteric stump excisions. Four out of five of their patients experienced ureteroceles before their upper-pole heminephrectomies. Two patients in this group were treated with an endoscopic puncture before their upper-pole heminephrectomy, while the other patients were not.⁴ From this we could assume that an endoscopic puncture before an upper-pole heminephrectomy is not associated with late distal-ureteric-stump complications, further research would clarify this.

Androulakakis et al.⁸ reported that three of their 89 patients required a ureteric stump excision. One patient experienced recurrent hematuria and bacteriuria despite antibiotic treatment, whilst the other two patients were referred from other hospitals. Both of these two patients required stump excisions, and Androulakakis et al. found that the stumps in these patients had been left extended above the iliac crest. One patient had a refluxing stump, and the other patient had a non-refluxing stump which converted into a refluxing stump as a result of dysfunctional voiding. A long stump could be a potential risk factor in the pathogenesis of ureteric stump syndrome.⁸ Some studies^{11,12} have suggested total ureterectomies to treat high-grade refluxing stumps, but this procedure carries a risk of injury to the healthy lower-moiety ureter. Thus, an upper-pole-moiety ureter should be excised as far as possible to prevent stump complications.

Tonvichien et al. reported that 7/25 (28%) ureterocele cases underwent upper-pole heminephrectomy alone and 1 needed excision of the ureterocele and common sheath reimplantation due to high grade reflux of the lower moiety ureter. They concluded that transurethral incision of ureterocele is the treatment of choice for decompression of the obstructed hydroureter but a second operation is needed in complicated cases especially in patients who have multiple lower tract anomalies.¹³

In our study, five out of ten patients had experienced late complications. Resection of the ureteric stump and ureterocele was required in one patient (10%) due to a prolapsed ureterocele. The incidence rate for secondary procedures in our study was similar to the corresponding rates in previous studies (1-13%).^{8,11,14,15} One patient

had a stump abscess and underwent percutaneous drainage (PCD); she experienced good results and did not require stump excision. Another patient experienced intermittent vaginal discharge, this symptom being relieved after a five-year follow-up. Meanwhile, another patient experienced a single UTI episode that was treated with an oral antibiotic.

Ureteric stump abscesses have been reported in 0.8%-1% of cases of upper pole heminephrectomy¹⁶ The traditional treatment is ureteric stump excision^{17,18}, but minimally invasive techniques are available for drainage without a stump excision, for example transurethral fulgulation or transgluteal percutaneous drainage.¹⁵ In this study we performed percutaneous retroperitoneal drainage for a ureteric stump abscess and were able to forego the need for a ureteric stump excision.

Robot-assisted upper-pole heminephrectomies can present as an interesting choice for heminephrectomies because of their good surgical fields, small surgical scars, and removal of more of the ureter than an open approach. Our patient who underwent this robot-assisted treatment option experienced less postoperative pain and a quicker recovery.¹⁴ In our institution, robotic surgery is most often used in prostate and kidney surgery. We performed the institution's first case of robot-assisted laparoscopic upper-pole heminephrectomy, and the outcome was promising, as is suggested in related literature.^{11,14}

Conclusions

Our study results showed five-cases in which there were long-term complications. Only one of these patients required a distal ureteric stump excision, this result being similar to another study in which the majority of patients did not require stump excision. The other complications in patients in this study were minor, and could be treated with local anesthetic intervention for stump abscesses and oral antibiotics for UTIs. Therefore, upper pole heminephrectomy with subtotal ureterectomy was the appropriate option for in-patients with double collecting system and non-functioning upper moiety.

Conflicts of Interest

The authors declare no conflict of interest.

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