Long-term Outcome of Ileal Ureteric Replacement With an Iliopsoas Muscle Tunnel Antirefluxing Technique for the Treatment of Long-segment Ureteric Strictures

Yue-Min Xu, Chao Feng, Haruaki Kato, Hong Xie, and Xin-Ru Zhang

OBJECTIVE To investigate the long-term outcome of ileal ureteric replacement using a proximal antirefluxing technique for the treatment of long-segment ureteric strictures.

PATIENTS AND METHODS Between January 1997 and December 2013, 41 patients with a long ureteral stricture or defect and 3 patients with unilateral mid-lower ureteral cancer (20 bilateral and 24 unilateral, 28 males and 16 females) were treated by ureteral substitution using a proximal antirefluxing technique. The distal part of the upper ureter (4 cm) was fixed between the psoas muscle and the ileal segment (the iliopsoas tunnel technique). The distal ileum was connected to the urinary bladder with an end-to-side anastomosis. A successful outcome was defined as the absence of major complications, worsening baseline renal function, metabolic derangements, or obstruction.

RESULTS One patient with unilateral mid-lower ureteral cancer died 3 years postoperatively because of metastasis, and the remaining 43 patients were followed for 12-180 months (mean 69 months). Intravenous urography showed that the hydronephrosis improved significantly or disappeared after 6-12 months in 34 patients, with improvement in 9 patients. Cystography showed no evidence of ileoureteral reflux. Seven patients needed long-term oral alkalization to prevent hyperchloremic acidosis.

CONCLUSION In our experience, outcomes following subtotal ureteric replacement are encouraging. The ileal ureter replacement by the proximal antirefluxing technique appears to be a reliable procedure for treating long-segment ureteral stricture and preservation of renal function. UROLOGY 88: 201–206, 2016. © 2016 Elsevier Inc.

Although long ureteral strictures or defects are not common, they can have a severe result and impair the quality of life of a patient. If the defect is too long to be repaired by a Boari bladder flap or bladder psoas hitch, the treatment for this disease is always a great challenge. In the last decades, various surgical techniques have been reported.[1-7] Nevertheless, no procedure has been chosen as the gold standard technique. Among those procedures, ileal ureteric replacement is commonly performed.[3-8] However, various concerns and questions remain as to the long-term viability of the procedure, as follows: Is refluxing or nonrefluxing anastomosis preferred? How effective is the procedure for maintaining renal function? How prevalent are postoperative metabolic derangements, and how can they be avoided?

To date, the long-term results of ileal ureteric replacement are satisfactory when it was used for the long upper ureteral stricture with normal renal function. However, the results of ileal ureteric replacement are not satisfied when upper ureter is very short and simple nonrefluxing anastomosis was chosen. Due to the high pressure and subsequent colonization of microorganisms, the incidence of urine reflux will increase, which can lead to the deterioration of renal function.

The aim of this study is to perform a retrospective observational descriptive analysis about the long-term outcomes of patients who underwent surgery using the ileum to replace the unilateral or bilateral ureter in 5 different clinical centers.

Yue-min Xu and Chao Feng contributed equally.

Financial Disclosure: *The authors declare that they have no relevant financial interests.*

From the Department of Urology, Shanghai Jiaotong University Affiliated Sixth People's Hospital, Shanghai, China; the Shanghai Eastern Institute for Urologic Repair and Reconstruction, Shanghai, China; and the Department of Urology, Shinshu University School of Medicine, Matsumoto, Japan

Address correspondence to: Yue-Min Xu, M.D., Ph.D., Department of Urology, Shanghai Jiaotong University Affiliated Sixth People's Hospital, 600 Yi Shan Road, Shanghai 200233, China. E-mail: xuyuemin@263.net

Submitted: August 24, 2015, accepted (with revisions): November 3, 2015

http://dx.doi.org/10.1016/j.urology.2015.11.005
0090-4295

PATIENTS AND METHODS

We performed a retrospective, observational study of 44 patients, who underwent a proximal or subtotal ureteral substitution using ileal segments, between January 1997 and December 2013. The study included 28 men and 16 women with a median age of 41 years (range 15-69 year). The etiology of the ureteral stricture was secondary to primary retroperitoneal fibrosis in 16 patients, iatrogenic retroperitoneal fibrosis in 4 cases, iatrogenic ureteral injury in 18 cases, mid-lower ureteral carcinoma in 3 cases, ureteral defection due to trauma in 1 case, severe ureteral stricture due to tuberculosis in 1, and recurrent urolithiasis resulting in multiple mid-ureteric strictures in 1 case (Table 1). The lesions involved bilateral ureters in 20 patients and unilateral ureter in 24 patients. Thirty-two patients with bilateral or unilateral renal insufficiency underwent percutaneous nephrostomy for 2-18 months.

After admission, all patients received a regular laboratory examination, including serum creatinine and plasma electrolytes (sodium, chloride, and potassium). The imaging examinations included urinary ultrasound, abdominal plain film, and intravenous urography (IVU). The glomerular filtration rate (GFR) was determined in patients with poor renal function before operation. Retrograde pyelography was performed in 36 patients and failed in 24 patients because of difficulty in intubation, cryptoscopic intolerance, or other factors. The definite indication to the ileal ureteric replacement was that the length of ureteral stricture or defect should be more than 15 cm based on the preoperative examinations. Bladder outflow obstruction was preoperatively excluded from all patients.

Surgical Technique

The surgical technique has been described previously.[7,8] A section of the terminal ileum of 45-50 cm in length is isolated for bilateral ureteric replacement, and a section of 20-25 cm is isolated for replacement of the unilateral ureter. The proximal end of the ileal segment is closed. An end-to-side anastomosis between the right spatulated upper ureter and the posterior surface of the ileal segment of 4-5 cm from the closed ileal end is made (Fig. 1A). The proximal part of the ileal segment (4-5 cm) is then fixed at its lateral borders to the psoas muscle with 2/0 polyglactin as an antireflux valve (Fig. 1B,C). Thus, the distal part of the ureter is located in a tunnel between the ileal segment and psoas muscle (the iliopsoas tunnel).

The ileal segment is then led retroperitoneally in front of the great vessels to the well-mobilized left upper ureter. The procedure for the antirefluxing valve for the left upper ureter is the same as that for the right. The distal portion of the ileal segment is anastomosed to the posterior wall of the bladder.

In three patients with mid-lower ureteral carcinoma, a 20-cm ureter was dissected. The dissection length ranged from the bladder wall to 5-8 cm above the ureteral tumor. The ileal segment was also used for bladder enlargement in one patient with tubercular contractive bladder.

Table 1. Indications for ileo-ureteral substitution

Indications	No. Pts
Primary retroperitoneal fibrosis	16
Iatrogenic retroperitoneal fibrosis	4
Iatrogenic ureteral injury	18
Mid-lower ureteral carcinoma	3
Ureteral defect due to trauma	1
Multiple ureteral stricture due to tuberculosis	1
Recurrent urolithiasis	1
Total	44

Postoperative Care

Intravenous broad spectrum antibiotics were routinely used for at least 1 week. For those patients who underwent bilateral ureteral replacement or suffered from insufficient renal function, oral alkalization, such as sodium bicarbonate, was routinely used to prevent metabolic derangements for 6-12 months. Based on the renal function and plasma electrolyte results during follow-up, the surgeon could determine the optimal time to withdraw the alkalization. The ureteral stents were removed 2 weeks after the operation.

All patients were all followed up every 3 months for the first 12 months, 1-2 years thereafter. Follow-up testing includes analysis of blood gas and evaluation of renal function. The imaging examination included ultrasonography, abdominal plain film, IVU, and GFR.

The successful outcome was defined as the vanishing or obvious improvement about the hydronephrosis by IVU, no evidence of ileo-ureteric reflux during cystography, progressive recovery of renal function, and absence of surgery-related major complication during follow-up.

RESULTS

All patients successfully underwent the operation. One patient with unilateral mid-lower ureteral cancer died 3 years postoperatively because of metastasis. The remaining 43 patients were followed up for 12-180 months (mean 69 months). The total successful outcome was 97.7% (43/44). There were no acute perioperative complications in any of the patients. For the patients with late complication, no severe infection or malignancy were noticed after the operation. Only grade II (Clavien-Dino classification) adhesive intestinal obstruction was noticed in 2 patients, which were resolved by conservative treatment.

Seven patients with renal functional impairment before operation needed long-term application of sodium bicarbonate after ileal replacement in bilateral ureters (Table 2). Of the 7 patients, 1 patient was followed up more than 12 years (Table 2, No. 1); the imaging examination did not show evidence of hydronephrosis or ileal dilation (Fig. 2A-C). Two patients with very severe hydronephrosis (Table 2, Nos. 2 and 3) suffered from obvious renal functional impairment due to primary retroperitoneal fibrosis preoperatively. Their serum creatinine increased to 650 and 700 μmol/L, respectively. After hemodialysis and percutaneous nephrostomy, their serum creatinine returned to 120 μmol/L 3 months later. The ileum was then used to replace the bilateral ureter. Mild metabolic hyperchloremic acidosis was diagnosed in both patients in the early postoperative stage. The serum chloride levels of the 2 patients were 108 and 109 mmol/L. However, hyperchloremic acidosis was successfully treated with oral sodium bicarbonate. Their serum creatinine decreased to the almost normal level (115-120 μmol/L) and was maintained for 6 and 8 years, respectively.

For the remaining 2 patients (Table 2, Nos. 6 and 7) with severe hydronephrosis and obvious renal functional