The Common Ileal Ureter: A New Technique for Compliant Ureterocystoplasty

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Purpose: Ureterocystoplasty is an effective technique for bladder reconstruction in patients with megaureter. Initial reports were encouraging but later repeat augmentation with bowel was necessary in many patients. We evaluated whether repeat augmentation after ureterocystoplasty could be avoided using two-thirds of each megaureter.

Materials and Methods: Ureterocystoplasty was performed in 6 patients using the distal two-thirds of the 2 ureters. Continuity was reestablished by anastomosis of the remaining proximal ureters to a tubularized and tapered piece of ileum, which was reimplanted in an antireflux manner into the reconstructed bladder. All patients underwent preoperative and postoperative evaluation with ultrasound, creatinine, voiding cystourethrogram, nuclear renal scan and videourodynamic testing.

Results: Patient age at ureterocystoplasty was between 7 and 15 years with a median followup of 45.3 months. Preoperative videourodynamics demonstrated low capacity bladders with grade 5 vesicoureteral reflux and a poor mean bladder compliance of 7.4 ml/cm H_2O. Bladder capacity increased up to 12-fold postoperatively with a mean compliance rate of 58 ml/cm H_2O and vesicoureteral reflux resolved in all patients. One patient required endoscopic incision of the reimplanted common ileal ureter but no other complications occurred.

Conclusions: The common ileal ureter provided a long-term compliant reservoir without the need for future repeat augmentation in all patients. Using standard urological techniques the complication rates remained low and recovery time was similar to that of standard ureterocystoplasty.

Key Words: bladder; ureter; anastomosis, surgical; ileum

Despite advances in the preoperative and postnatal diagnosis and management of neurogenic bladder disease, bladder augmentation remains a necessity for many affected patients to protect the upper tracts. In the last decades several groups have tried to replace mucous producing segments of the gastrointestinal tract with suitable tissue to decrease side effects and complications.[1] Ureterocystoplasty has been shown to be an effective technique for bladder reconstruction in a select group of patients with megaureters. Initial reports demonstrated a significant increase in bladder capacity and compliance with stable renal function and hydronephrosis.[2] Landau et al compared 8 patients undergoing ureterocystoplasty with a matched group undergoing ileocystoplasty and reported almost identical clinical and urodynamic outcomes.[3] Initially the ureter was harvested from poorly functioning kidneys at nephrectomy. Other groups used the dilated distal ureters of the 2 functioning kidneys and combined the ureters via transureterourereterostomy for single ureteral reimplantation.

These initial positive results were challenged by Husmann et al in a multi-institutional study after several groups found that patients frequently required repeat augmentation after ureterocystoplasty.[4] Husmann et al reviewed preoperative ultrasound, voiding cystourethrogram, and preoperative and postoperative urodynamic studies in 64 patients to evaluate who would benefit most from the procedure. They found that the used ureteral tissue was often not sufficient to provide the necessary bladder capacity and compliance needed to protect the upper tracts.

We evaluated whether repeat augmentation after ureterocystoplasty could be avoided by using two-thirds of each megaureter. The remaining proximal ureters were anastomosed to a tubularized piece of ileum, which was reimplanted into the bladder in an antireflux manner. The clinical outcome of this common ileal ureter was evaluated using the same strict criteria established by Hussmann et al.[4]

MATERIALS AND METHODS

We performed a retrospective chart review of 6 patients undergoing ureterocystoplasty from 2000 to 2001 at our institution. The study protocol was approved by the institutional review board committee of the University of Oklahoma. Informed consent was obtained before surgery was performed.

All patients underwent preoperative and postoperative evaluation with US, creatinine, voiding cystourethrogram, nuclear renal scan and VUDS. Preoperatively all patients had some degree of spontaneous voiding and they additionally performed CIC via the urethra.

All patients underwent ureterocystoplasty using the distal two-thirds of the 2 ureters. Urinary system continuity was reestablished by ureteral anastomosis of the remaining proximal ureters to a tubularized and tapered piece of ileum. This common ileal ureter was subsequently reimplanted in

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DOI:10.1016/j.juro.2007.03.158

an antireflux manner into the reconstructed bladder. Four of the 6 patients additionally underwent creation of a catheterizable appendicovesicostomy as described by Mitrofanoff to circumvent urethral catheterization.

US was graded following Society for Fetal Urology guidelines for hydronephrosis. The amount of ureteral dilatation was measured in cm using longitudinal ultrasound at the bladder level. Urodynamic studies were performed as described by Hussmann et al.[4] VUDS was added to visualize the onset of VUR and judge the voiding phase. Bladder compliance was defined as the change in bladder volume per unit change in bladder pressure in ml/cm H_2O, as measured at end fill bladder capacity. Normal compliance was defined as greater than 30 ml/H_2O. Mild, moderate and severe noncompliance was defined as 29 to 20, 19 to 10 and less than 10 ml/cm H_2O, respectively.[5] Preoperative bladder capacity was defined as measured capacity at VUR onset. Nuclear renal scans were done to evaluate drainage, function and renal scar formation using diethylenetriamine pentaacetic acid with Lasix® administration at 20 minutes or mercaptoacetyltriglycine effective renal plasma flow in ml/min.

Surgical Technique

Standard access was achieved via a midline incision. The ureters were mobilized and divided 5 to 7 cm distal to the ureteropelvic junction. For the common ileal ureter a 7 to 15 cm segment of ileum was harvested in isoperistaltic orientation. The proximal end was anastomosed to the proximal ureters using the Bricker[6] or Wallace[7] technique. The distal 5 to 7 cm of the ileal segment was tapered over a 10Fr catheter following the standard excisional tapering technique described for megaureters and reimplanted antireflux into the native bladder.[8] The remaining 15 to 20 cm distal segments of the 2 ureters were detubularized, reconfigured to form a patch and augmented onto the opened bladder, as described by Wolf et al.[9]

Suprapubic and ureteral catheters were left indwelling for 2 and 3 weeks, respectively. A closed suction drain was left for 1 week. Postoperative care was done following the principles of routine enterocystoplasty (fig. 1).

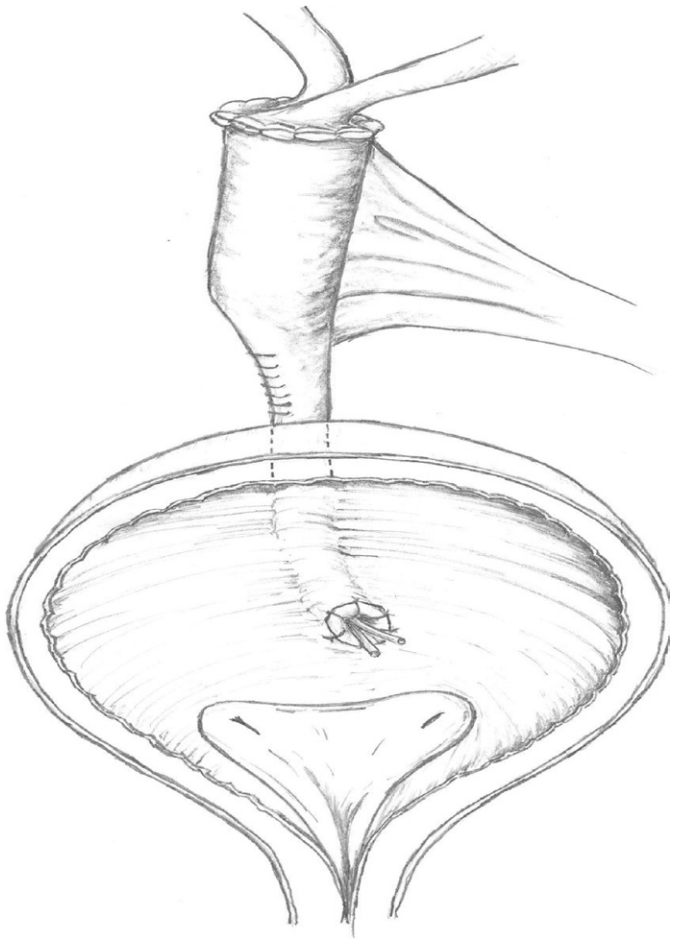

FIG. 1. Common ileal ureter with tapered ileal segment reimplanted into bladder and ureteral anastomosis using Wallace technique.

RESULTS

The etiology for noncompliant bladder with associated megaureters was PUV in 4 cases, anterior urethral valves in 1 and nonneurogenic neurogenic bladder in 1. All patients with PUV underwent vesicostomy in the infant period, followed by vesicostomy closure and valve resection in the first 2 years of life. All patients were treated preoperatively with spontaneous voiding, CIC, and anticholinergic and prophylactic antibiotic treatment. Patient age at ureterocystoplasty was between 7 and 15 years (median 10.6). Followup was 27 to 52 months (median 45.3).

All patients performed regular CIC with spontaneous voiding and were on nighttime catheter drainage. All patients are currently continent via the urethra and/or urinary stoma, defined as a dry interval of more than 3 hours. We continue to regularly follow 5 of the 6 patients at our institution. One patient was lost to followup due to incarceration. All surgeries were performed by a single surgeon (BPK) and no intraoperative complications occurred.

All patients presented preoperatively with grade 4 dilatation of the renal collecting system on US. Postoperatively the kidneys demonstrated decompression of the collecting system with improvement in pelvic and caliceal dilatation. However, due to parenchymal thinning renal dilatation still had to be considered grade 4. All patients presented preoperatively with bilateral hydroureters. Preoperative diameter of the distal ureters measured behind the bladder was between 0.9 and 1.8 cm (mean 1.4). In 2 patients the proximal ureters were also visualized preoperatively on US. Postoperatively the ureters completely decompressed and were no longer visualized on US. Preoperative VUDS demonstrated low capacity bladders with grade 5 VUR at low volumes and poor bladder compliance between 1 and 15 ml/cm H_2O (mean 7.4). Postoperatively bladder capacity increased up to 12-fold with good compliance rates between 20 and 116.7 ml/cm H_2O (mean 58). VUR resolved in all patients (fig 2).

Preoperative nuclear renal scans and creatinine values confirmed chronic renal insufficiency in 4 patients (see table). Three of those patients had worsening renal function during followup, while 1 showed improvement. Renal function stabilized postoperatively but 2 patients ultimately required renal transplantation. Transplant function remained stable throughout followup. In patient 3 renal function stabilized postoperatively for 12 months but he continued to be noncompliant with the CIC regimen. Renal failure developed and the patient was ultimately lost to followup 31 months postoperatively. The table lists individual findings