Long-Term Outcomes of the Neobladder in Pediatric Continent Urinary Reconstruction

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Purpose: In rare instances when native bladder tissue is either unsuitable or unavailable a continent neobladder may be an option for pediatric lower urinary tract reconstruction. We report our long-term outcomes and experience in this challenging patient population.

Materials and Methods: A retrospective cohort study was performed of all patients who underwent creation of a neobladder at 2 pediatric institutions. Patient demographics, surgical details and clinical outcomes were abstracted from the medical records.

Results: A total of 26 patients were identified with a median age of 8.9 years at surgery. Median followup was 8.0 years. Most procedures used a composite of gastric and ileal tissue. All patients were continent of urine and had a stable upper urinary tract. Median bladder capacity was 400 ml. Postoperative complications included reservoir stones (8 patients), febrile urinary tract infection (8), metabolic acidosis (6), small bowel obstruction (4), bladder perforation (4) and pelvic lymphocele (1). Five patients had difficulty with catheterization due to stomal stenosis. Gross hematuria with clots developed in 1 patient with anuria who had a gastroileal neobladder and was awaiting renal transplantation. No other patient with a gastric component had the hematuria-dysuria syndrome. Five patients had end stage renal disease and subsequently underwent successful renal transplantation. No upper urinary tract deterioration was observed, and no malignant transformation has occurred.

Conclusions: Creation of a continent neobladder is a reconstruction option in children when bladder augmentation is not feasible. However, complication rates are not insignificant, underscoring the need for careful long-term followup.

Key Words: treatment outcome; urinary diversion; urinary reservoirs, continent; urologic surgical procedures

Submitted for publication October 20, 2008.

Presented at annual meeting of American Urological Association, Anaheim, California, May 19–24, 2007.

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In children with severe neuropathic bladder dysfunction medical management by clean intermittent catheterization and anticholinergic medication is the initial option to protect the upper urinary tract and achieve acceptable social urinary continence. When this course of treatment fails surgical intervention can be offered to achieve these goals. The ideal outcome is creation of a urinary reservoir that stores an appropriate volume of urine for patient age at a low filling pressure. The system should be efficiently and completely drained with a minimum of metabolic derangements and surgical complications.

Surgical options may include bladder augmentation using enteric or gas-

0022-5347/09/1816-2689/0
THE JOURNAL OF UROLOGY®

Vol. 181, 2689-2694, June 2009
Printed in U.S.A.
DOI:10.1016/j.juro.2009.02.039

tric tissue if the native bladder dynamics are too hostile. However, in rare instances when the native bladder is missing or is too diseased to be incorporated into the reconstruction a neobladder may be considered as an alternative to an incontinent loop conduit. This approach has been extensively studied in adult populations, particularly after cystectomy for invasive bladder neoplasms. However, in the pediatric neuropathic bladder population most modern series combine outcomes of neobladders with those of bladder augmentations. We report our long-term experience with continent neobladders as a separate entity from enterocystoplasty.

MATERIALS AND METHODS

We performed a retrospective cohort study of all patients who underwent neobladder creation at 2 pediatric institutions between 1990 and 2006. All procedures were performed by 1 of 2 surgeons (CS, MK) during the study period. All patients were followed postoperatively with renal and neobladder sonography, reservoir contrast studies and formal urodynamic studies. Patient demographics, operative details, and radiographic and urodynamic data as well as surgical outcomes were abstracted from the medical records of the 2 institutions. Urinary continence was defined as a dry interval of at least 3 hours between catheterizations.

RESULTS

A total of 26 patients (10 males and 16 females) met inclusion criteria for the study. Primary diagnoses are described in table 1. Median age at reconstruction was 8 years and median postoperative followup was 8.9 years. The various tissues used for the creation of neobladder are described in table 2.

All patients underwent clean intermittent catheterization through a continent catheterizable neourethra. A total of 12 patients underwent reconfigured tubularized intestinal segment (Monti-Yang), 12 underwent appendiceal neourethra (Mitrofanoff) and 2 had a catheterizable channel created from the native urethra. The sizes of the catheters used in the cohort were generally 10Fr to 14Fr (most commonly 12Fr).

A total of 10 patients had an existing urinary diversion before continent reconstruction, which required undiversion at the time of neobladder creation. This group included 5 patients with a cutaneous ureterostomy of a solitary kidney and 2 with a cutaneous pyelostomy. Three patients were referred from elsewhere with a previously created incontinent ileal conduit. All patients underwent antirefluxing native ureteral reimplantation, and no patient had postoperative vesicoureteral reflux on reservoir contrast study. One patient had low grade vesicoureteral reflux into a transplant ureter at maximal urodynamic capacity, which was treated conservatively.

Table 1. *Patient demographics*

Diagnoses	No. Pts
Cloacal exstrophy	8
Bladder exstrophy	5
VACTERL association	4
Pelvic malignancy	6
Bilat single ectopic ureters	3

Table 2. *Composition of tissue used for continent neobladder*

Neobladder Type	No. Pts
Stomach + bowel	11
Indiana pouch	6
Penn pouch	2
Ileum + colon	2
Stomach	2
Stomach + hindgut	1
Colon	2
Total	26

Surgical Complications

There were no intraoperative complications documented. Table 3 lists postoperative complications and reoperation rate. Reservoir stones developed in 8 patients (31%), none with a gastric segment, and were treated endoscopically. Neourethra stomal stenosis with subsequent difficulty catheterizing occurred in 5 patients (19%). Conservative treatment with office dilation and/or topical steroid ointment failed in 3 of these patients, necessitating operative stomal revision. One patient had acute urinary retention due to inability to pass a catheter, which required emergency endoscopy and catheter placement. Two patients had Mitrofanoff neourethral pol-

Table 3. *Complications after continent neobladder*

	No. (%)
Surgical complications:	
Reservoir perforation	4 (15)
Small bowel obstruction	4 (15)
Reservoir calculi	8 (31)
Neourethra stomal stenosis	5 (19)
Urinary retention	1 (4)
Neourethral polyps	2 (8)
Metabolic acidosis	6 (23)
Hematuria-dysuria syndrome	1 (4)
Febrile urinary tract infection	8 (31)
Reoperations:	
Exploratory laparotomy	4 (15)
Stomal revision	3 (12)
Neourethral polyp excision	2 (8)
Endoscopic stone ablation	8 (31)