Comparison of Bladder Outlet Procedures Without Augmentation in Children With Neurogenic Incontinence

Warren Snodgrass* and Theodore Barber

From the Pediatric Urology Section, University of Texas Southwestern Medical Center and Children's Medical Center, Dallas, Texas

Purpose: We compared continence results of the bladder neck sling vs the Leadbetter-Mitchell bladder neck procedure plus fascial sling in children with neurogenic urinary incontinence.

Materials and Methods: We compared consecutive patients who received a 360-degree tight bladder neck sling to subsequent, similar patients who underwent a Leadbetter-Mitchell bladder neck procedure plus fascial sling involving a 50% reduction in bladder neck and proximal urethral diameter before a 360-degree tight sling. All patients underwent simultaneous appendicovesicostomy and none had undergone prior or simultaneous augmentation. All patients followed similar preoperative and postoperative protocols for urodynamic evaluation and anticholinergic therapy with data maintained prospectively.

Results: After surgery 46% of 35 sling cases did not require pads vs 82% of 17 Leadbetter-Mitchell cases with a sling ($p = 0.02$). Mean followup was 28 months in sling and 13 months in Leadbetter-Mitchell cases. Initial urodynamics done approximately 6 months postoperatively were similar in the 2 cohorts and no patient had hydronephrosis. Transient low grade reflux occurred in 2 Leadbetter-Mitchell cases, of which 1 with increased intravesical pressures early after surgery that caused trabeculation received increased medical management. Augmentation was not done in any patient except 1 previously reported on after a sling.

Conclusions: Patients undergoing Leadbetter-Mitchell procedure plus fascial sling were significantly less likely to require pads postoperatively than those with a sling alone. Adverse bladder changes have not required augmentation to date.

Key Words: urinary bladder, neurogenic; urethra; urinary continence; reconstructive surgical procedure; suburethral slings

Abbreviations and Acronyms

APV = appendicovesicostomy

BNS = bladder neck sling

CIC = clean intermittent catheterization

DLPP = detrusor leak point pressure

LMS = Leadbetter-Mitchell procedure plus fascial sling

UD = urodynamics

Study received institutional review board approval.

* Correspondence: Department of Urology, University of Texas Southwestern Medical Center and Children's Medical Center, 2350 Stemmons Freeway, Suite F4300, Mail Stop F4.04, Dallas, Texas 75207 (telephone: 214-456-2481; FAX: 214-456-8803; e-mail: warren.snodgrass@childrens.com).

We previously reported that 57% of children who underwent 360-degree fascial BNS for neurogenic bladder neck incompetency achieved urinary continence, defined as no or only rare leakage not requiring pads.[1] Another 27% of patients were improved but still required 1 to 2 pads per 24 hours while the others remained wet. All patients with continued incontinence had persistent outlet incompetency. Thus, to improve sling coaptation we added the Leadbetter-Mitchell procedure to reduce proximal urethral and bladder neck circumference in a second series of consecutive patients. We describe initial results.

MATERIALS AND METHODS

From 2001 to 2006 we performed 360-degree tight BNS in 39 consecutive patients for urinary incontinence due to neurogenic bladder outlet incompetence. Surgical technique and results in the first 30

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cases were previously reported.[1] One previously reported patient with subsequent augmentation was excluded from analysis as well as an additional 3 who did not undergo followup UD within the first 12 months postoperatively. From January 2007 to June 2009 LMS was done in 17 consecutive cases with a minimum 6-month followup, including postoperative UD within the first 12 months, comprising cohort 2. All patients also underwent APV but none underwent prior or simultaneous enterocystoplasty. No other patient had undergone alternative repair for neurogenic bladder outlet incompetence since 2001.

The diagnosis of outlet incompetence was made in patients with urinary incontinence when preoperative UD using a 7Fr transurethral catheter revealed areflexia with DLPP less than 50 cm H_2O. Hyperreflexia and/or decreased compliance were treated with anticholinergics. Final preoperative UD revealed areflexia in all patients.

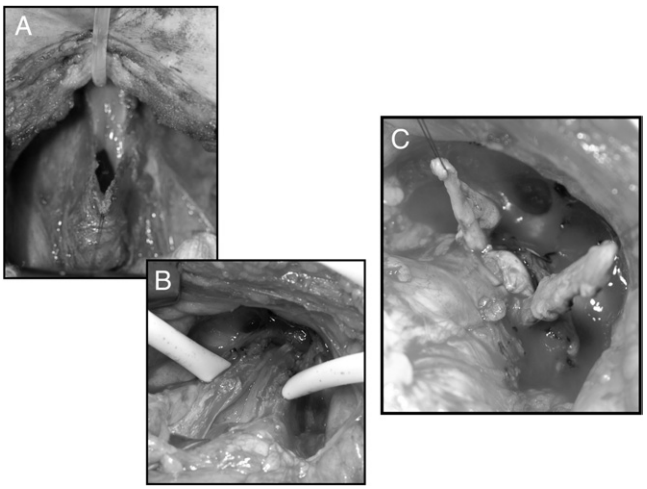
Renal ultrasound and fluoroscopy during UD were done as urinary tract imaging preoperatively and postoperatively. No patient had hydronephrosis, reflux or bladder trabeculation preoperatively.

Preoperatively and postoperatively anticholinergics included 0.2 mg/kg oxybutynin per dose orally 3 or 4 times daily or extended release oxybutynin twice daily. When used, 5 to 10 mg oxybutynin per dose were instilled intravesically twice daily in preadolescents and adolescents, respectively.

Bladder neck access was facilitated by posterior midline dissection after mobilizing the peritoneum from the bladder dome.[2] For BNS the rectus fascia was wrapped tightly 360 degrees around the bladder neck and secured with 2-zero polypropylene to the pubic periosteum. Leadbetter-Mitchell repair was done anteriorly, beginning with a transverse incision in the urethra near the pelvic diaphragm from the 3 to the 9 o'clock position and continued proximally as parallel incisions on each side of the urethra through the bladder neck, ending below the trigone. The resultant urethral strip was retubularized in 2 layers using continuous subepithelial 4-zero polydioxanone, resulting in a 50% reduction in urethral/bladder neck circumference (see figure). The urethral catheter was removed, and a rectus fascial sling was tightly wrapped 360 degrees around the bladder neck and sutured to the pubic periosteum. After BNS and LMS the bladder dome was hitched to the posterior rectus fascia near the umbilicus and APV was done. CIC resumed 3 to 6 weeks postoperatively.

Postoperative evaluation included initial renal ultrasound and UD with fluoroscopy using a 7Fr catheter through the APV approximately 6 months after surgery and then annually. Continence was defined as dry—no or only rare leakage requiring no pads, improved—1 to 2 pads per 24 hours or wet—more than 2 pads per 24 hours in patients who performed CIC every 3 hours.

We categorized maximum detrusor pressure (DLPP or end filling pressure without leakage) preoperatively and postoperatively as less than 25, greater than 25 but less than 40 and greater than 40 cm H_2O in patients with detrusor areflexia with or without anticholinergic therapy. Bladder capacity was evaluated using the formula for expected volume, (age +2) × 30, for preoperative UD and as the percent change from this volume on postoperative UD.



Proximal TIP with foreskin reconstruction. *A*, penoscrotal hypospadias with scrotal cleft. *B*, exposure after ventral incision from preputial corners to beneath meatus and continuing down scrotal cleft. *C*, completed repair with foreskin reconstruction and scrotal cleft correction.

Data on UD findings, anticholinergics, imaging and continence outcomes were maintained prospectively in all patients. With institutional review board approval we reviewed these data for this report. Statistical analysis of continence outcomes was done using Fisher's exact test with continuous variable means compared with the unpaired t test.

RESULTS

There was no difference in characteristics of patients with BNS vs LMS. Of the patients 21 (60%) vs 11 (65%) were male, mean age was 8.1 (range 3 to 17) vs 7.1 years (range 3 to 18, $p = 0.4$) and 22 (63%) vs 11 (65%) were ambulatory. All patients were wet and used diapers preoperatively, routinely changing pads at each catheterization. After BNS and LMS mean postoperative followup was 28 (range 6 to 94) vs 13 months (range 6 to 34) after LMS. Dryness was reported by 16 of 35 children (46%) with BNS vs 14 of 17 (82%) with LMS ($p = 0.02$).

No patient had hydronephrosis. Transient low grade reflux (grade I or II) not seen preoperatively was observed during initial postoperative UD in 2 patients who underwent LMS but not on subsequent studies 2 and 4 months later. Of these boys 1 had maximum detrusor pressure less than 25 cm H_2O postoperatively and in the other detrusor pressure up to 100 cm H_2O was treated with oral and intravesical oxybutynin plus overnight continuous catheter drainage. No further reflux was noted on 2 subsequent cystograms, although trabeculation with 4 cellules was observed. Maximum detrusor