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Clinical indications for augmentation in children with neurogenic urinary incontinence following bladder outlet procedures: Results of a 14-year observational study

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Summary

Purpose
We report continence, upper tract changes, and augmentation indications and rates in consecutive patients undergoing bladder outlet surgery without augmentation for neurogenic urinary incontinence.

Methods
From 2000 to 2007, 37 patients underwent bladder neck sling (BNS), and from 2007 to 2013, 45 patients had Leadbetter/Mitchell bladder neck revision plus sling (LMS), all without augmentation. Mitrofanoff channels were created in all cases. Twenty children with persistent outlet insufficiency underwent bladder neck closure (BNC). All patients had pre- and postoperative urodynamic testing (UD).

Results
Mean follow-up was 60 months after BNS, 38 months after LMS, and 29 months after BNC. Continence (dry, no pads) was achieved significantly more often with LMS versus BNS (66% vs. 37%). There were no significant differences between these patients in preoperative UD % capacity, end filling pressure (EFP), or compliance. Those that became dry had a greater % capacity on postoperative UD, but postoperative EFP was similar between dry and wet LMS and BNS patients. BNC resulted in dryness in 65% of patients, with most incontinence occurring from the Mitrofanoff stoma associated with filling pressures >40 cm. A total of 10 (12%) children had augmentation, seven after BNC. Clinical indications were end filling pressures >40 cm plus hydronephrosis ≥ grade 3, and/or persistent incontinence. Need for augmentation was not predicted by preoperative urodynamic parameters. Postoperative UD in those who were augmented showed significantly less % capacity and compliance, and significantly greater EFP, than those not augmented.

Conclusions
Dryness was achieved in only 33% of BNS versus 66% of LMS and BNC patients. Twelve percent of consecutive children undergoing bladder outlet surgery for neurogenic incontinence developed clinical parameters leading to augmentation. These occurred most often after BNC.

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Introduction

Optimal management of neurogenic urinary incontinence secondary to bladder outlet incompetency in children is ill-defined, with the frequent combination of surgery to coapt the outlet plus simultaneous augmentation making the relative role of each unclear. Nevertheless, augmentation for neurogenic incontinence increased during the past 25 years, being done in less than half the patients following artificial sphincter implantation in the 1980s [1–4], but in most children undergoing slings in the 1990s and 2000s [5–8]. While the combination of bladder neck sling and augmentation achieved dryness in 37%–88% of patients in these series, specific indications for augmentation have not been determined and it potentially increases risk for complications, including bladder rupture, bladder stone, vitamin B12 deficiency, and malignancy.

Beginning in 2000, a standardized protocol was instituted for diagnosis and management in consecutive patients for bladder outlet coaptation without simultaneous augmentation. The goal was to determine predicting factors from those who subsequently required augmentation.

Initially, bladder outlet surgery comprised a tight 360° facial sling (BNS) [9], but when approximately half the patients continued to have outlet incompetency, Leadbetter/Mitchell bladder neck revision plus sling (LMS) was done in consecutive cases to reduce the caliber of the bladder neck by 50% before wrapping the 360° sling [10]. BNS patients with persistent outlet incompetence underwent reoperation by LMS or bladder neck closure (BNC), while failed LMS patients underwent BNC. Augmentation was done based on clinical parameters, including detrusor pressures >40 cm with persistent hydronephrosis (HN) and/or incontinence despite anticholinergics.

The primary aims of the current study are to report continence outcomes and augmentation rates following this protocol. A secondary aim is to report urodynamic (UD) parameters for wet and dry patients.

Materials

Diagnosis of outlet incompetency

The diagnosis of outlet incompetency was made in children with neurogenic bladders having urinary incontinence with detrusor leak point pressure (DLPP) < 50 cm water. Because detrusor overactivity sometimes is not seen during UD, all patients underwent a trial of anticholinergics and CIC every 3 h preoperatively.

UD

Preoperative UD were performed using fluoroscopy with the patient seated upright. Room temperature contrast was infused by pump at 10% of the estimated bladder capacity (from the formula volume in mL = 30 [age in years +2]) per minute through a dual lumen 7 Fr urethral catheter. Images were obtained every 25–50 cc, varying by age. Studies were performed by a trained specialist under physician supervision. Patients with detrusor overactivity had repeat UD while taking anticholinergics to confirm that an acontractile detrusor was achieved. The final preoperative UD showed an acontractile detrusor in all cases. Intravesical pressure at the end of filling when leakage did not occur was termed the end filling pressure (EFP).

Postoperative UD were performed similarly, except the 7 Fr catheter was placed through the Mitrofanoff channel in all cases. Studies were obtained at approximately 6 months, 1 year, and then annually or every other year. UD were performed with patients taking their usual anticholinergics. All used fluoroscopy unless done only to determine response to recent change in anticholinergic dosing.

Medical therapy

All patients had anticholinergic therapy. Oxybutynin 0.2 mg/kg was given orally 3–4 × daily (or its equivalent as extended release tablets 2 × daily). Intravesical oxybutynin, when used, was instilled 2 × daily using 5 mg/dose for children and 10 mg for adolescents. CIC was done every 3 h, sometimes supplemented with overnight continuous catheter drainage.

After bladder neck surgery, all patients resumed preoperative oxybutynin dosing and CIC. Initially, overnight catheter drainage was reserved for those with EFP > 40 cm water on the first postoperative UD, but beginning in 2010 it was recommended for all patients until the postoperative UD was obtained. Those with EFP > 40 cm continued use thereafter.

Upper tract imaging

Preoperative renal sonography and cystography during UD were obtained in all patients. Similar postoperative imaging was scheduled for 6 months and 1 year. Renal sonography was done annually thereafter, with cystography continued during UD. Sonogram outcomes were described using SFU terminology. VUR was graded according to IRS criteria.

Bladder outlet surgery

BNS was done from 2000 to 2007, wrapping a fascial sling tightly 360° around the bladder neck without a urethral catheter, which was then elevated and secured to the pubic periosteum using 2–0 polypropylene sutures [9].

Beginning in mid-2007, LMS was done to reduce the caliber of the proximal urethra and bladder neck by 50% before the 360° tight fascial sling was placed [10]. This procedure began with a transverse incision distally in the urethra from 3 to 9 o'clock near its exit from the pelvis. The incision was then extended proximally on each side of the urethra to, and then through, the bladder neck, ending just below the trigone. A uniform width of the dorsal urethral strip was maintained into and above the bladder neck. This strip was then tubularized using 4–0 polydioxanone continuous suture in a single layer. Next, the sling was wrapped tightly 360° and secured to the pubic periosteum. A urethral catheter was not used postoperatively.

In all BNS and LMS the bladder was hitched to the undersurface of the rectus muscle near the umbilicus and a