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Outcomes of a minimally invasive surgical approach to manage persistent high-grade vesicoureteric reflux post successful augmentation cystoplasty of patients with non-compliant bladder☆

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Summary

Introduction
Secondary vesicoureteric reflux (VUR) is a common problem associated with non-compliant bladders. Management of this disorder is debatable in literature. Many authors reported high resolution rate of VUR with augmentation cystoplasty (ACP) alone. Others showed significant residual VUR after ACP and recommend ureteric re-implantation (UR) at time of augmentation.

Objective
Studying efficacy of endoscopic correction of persistent high-grade VUR (ECVUR) post successful ACP.

Design
Patients with non-compliant bladders and high-grade VUR are enrolled in the program of our institute, where they are initially managed conservatively. Those not responding are managed endoscopically using intravesical botulinum toxin A and ECVUR. Patients who are not candidates or failed this approach undergo ACP without UR.

A total of 82 patients with non-compliant bladder underwent ACP between 2001 and 2011. Of those, 24 patients had high-grade VUR with 44 refluxing units (RU), 20 bilateral and 4 unilateral. The mean age at intervention was 7.62 years with a mean follow-up of 5.6 years.

Patients with persistent high-grade VUR and recurrent breakthrough febrile UTI despite antibiotic prophylaxis following ACP were identified and enrolled in our prospective trial of interval ECVUR.

Statistical analyses was performed to identify predictors of high-grade VUR resolution after ACP and ECVUR. A p value <0.05 was considered statistically significant (Table 1).

Results
Of the 24 patients, 17 underwent ileocystoplasty and 7 underwent ureterocystoplasty. One of the patients that underwent ileocystoplasty found to have a blind ending RU that was excised.

Of the 36 remaining RU, 21/36 (58.3%) showed complete resolution in the first follow-up cystogram, and 1 showed complete resolution after 1 year. Two patients, each with single RU, received repeat ACP because of poor compliance and/or inadequate bladder capacity post ureterocystoplasty and showed complete resolution of reflux post-operatively, which increased the resolution rate post ACP to 66.6% (24/36) (Table 2).

Of the remaining 12 RU in 7 patients, 10 underwent trial of ECVUR. VUR resolved in 8 RU after the first trial and in another 2 after the second trial (Table 3). Parents of 1 patient with the remaining 2 RU preferred to continue with conservative management (Table 2).

Discussion
VUR in patients with non-compliant bladder is usually secondary to high detrusor pressure, low compliance and small capacity. Whereas some investigators showed high resolution rate of VUR post augmentation without UR, claiming that by successfully augmenting the bladder, compliance will increase, detrusor pressure will decrease, and as a result, VUR will spontaneously resolve. Others showed high incidence of persistent VUR (47–57%) and recommend UR at time of ACP.

In our study, the incidence of spontaneous resolution was 66.6% (24/36). In cases where VUR persists, ECVUR was performed. With this approach, VUR resolution increased to 94% (34/36).

This study is limited by the small number of patients, lack of randomization and lack of comparison group in which patients undergo ACP with UR.

Conclusion
ACP without UR with interval endoscopic management seems to be an effective and adequate treatment for high pressure, non-compliant bladder as well as high-grade VUR when conservative management fails.

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Introduction

Secondary vesicoureteric reflux (VUR), caused by neuropathic bladder or valve-bladder syndrome, is a common problem associated with a non-compliant bladder. The management of this disorder is a topic of debate in the literature [1–7]. High-grade VUR (grades 3–5), significantly increases the risk of recurrent febrile urinary tract infections (UTI) that may lead to permanent renal damage and devastating long-term complications [2,3]. Many authors have reported a high resolution rate of VUR with augmentation cystoplasty alone [1,5–7]. Others have shown significant residual VUR after augmentation cystoplasty and recommend ureteric re-implantation at the time of augmentation [2,3,8].

Endoscopic correction of VUR (ECVUR) is a widely used minimally invasive approach that has gained popularity in managing VUR in a normal compliant bladder that failed conservative treatment. This approach has also been used to treat VUR in non-compliant bladders [9,10].

In our institute, we manage patients with non-compliant bladders and high-grade VUR with augmentation cystoplasty alone assuming that by correcting the primary bladder pathology and converting a high pressure bladder into low pressure, VUR will resolve. Those with persistent high-grade VUR (grades 3–5) and recurrent breakthrough febrile UTIs despite antibiotic prophylaxis were enrolled in our trial of endoscopic management of VUR. No previous studies to our knowledge have examined the efficacy of ECVUR in patients with persistent, symptomatic, high-grade VUR post augmentation cystoplasty.

Materials and methods

Patients with non-compliant bladders and high-grade VUR (grades 3–5) are enrolled in the program at our institute, where they are initially managed conservatively with antibiotic prophylaxis, anticholinergics and clean intermittent catheterization (CIC). Those who are not responding to the conservative approach are managed endoscopically using intravesical botulinum toxin A, ECVUR, CIC and bowel management as needed [10]. Patients who are not candidates for this approach, valve bladder patients with very small bladder capacity, or who failed to gain normal compliance and/or continence with this approach, intravesical pressure >40 cmH_20 at low volumes, $<50\%$ of expected capacity, and/or incontinence in <3 h, undergo augmentation cystoplasty without ureteric re-implant.

A total of 82 patients with non-compliant bladder underwent augmentation cystoplasty in the period between 2001 and 2011 in our institute. Of those 24 patients, 13 boys and 11 girls, had high-grade VUR with 44 refluxing units, 20 bilateral and 4 unilateral, 23 grade 5, 13 grade 4 and 8 grade 3, who failed our conservative and/or minimally invasive approach and underwent augmentation cystoplasty. The mean age at intervention was 7.62 years with a mean follow-up of 5.6 years. The underlying pathology for non-compliant bladder was neuropathic bladder (meningomyelocele in 12 cases, anorectal malformation in 2 cases, sacral agenesis in 1 case and syringomyelia in 1 case) and non-neuropathic bladder (valve-bladder syndrome in 6 cases and Hinman syndrome in 2 cases).

All patients were fully examined using renal function tests, ultrasound, VCUG and urodynamic studies preoperatively as well as 3–6 months postoperatively, putting in mind that UDS might not be so accurate in the presence of high-grade VUR. Patients were then examined semiannually with an ultrasound and renal function test as well as an annual VCUG for patients with symptomatic persistent high-grade VUR. The international reflux study classification for the grading of VUR is used [11].

Patients with persistent high-grade VUR and recurrent breakthrough febrile UTI despite antibiotic prophylaxis following augmentation cystoplasty were identified and enrolled in our prospective trial of interval ECVUR, between 2001 and 2011, where dextranomer/hyaluronic acid copolymer injection using hydrodistension-implantation technique (HIT) was performed on a day surgery basis [12].

Statistical analyses was performed using inter-cooled STATA, version 9.2. A univariate analysis was performed to identify the predictors of high-grade VUR resolution after augmentation cystoplasty and ECVUR, including a chi-square test for comparison of the categorical data. A p value <0.05 was considered statistically significant (Table 1).

Results

Of the 24 patients, 17 underwent ileocystoplasty and 7 underwent ureterocystoplasty; 17 required continent catheterizable stoma and none required bladder neck reconstruction as it looked competent by VCUG imaging and cystoscopic examination. Detrusectomy was not considered as all patients had non-compliant small capacity bladder.

Of those patients who underwent ureterocystoplasty, 4 underwent laparoscopic nephrectomy of a non-functioning kidney, and each kidney's dilated tortuous refluxing ureter was used for ureterocystoplasty. For the remaining 3 patients who underwent ureterocystoplasty, a transureteroureterostomy was performed while using the distal

Table 1 Factors associated with VUR resolution after augmentation cystoplasty.

Variable	VUR resolution rate	*P* value
Age		0.47
<8 years	61.9%	
>8 years	73.3%	
Type of augmentation		0.51
Ileocystoplasty	70%	
Ureterocystoplasty	57.1%	
Underlying pathology		0.381
Neuropathic bladder	64.7%	
Non-neuropathic bladder	44.4%	
CIC compliance		0.235
Good compliance	75%	
Poor compliance	43.75%	